THE

FOUNDRY TRADE JOURNAL

WITH WHICH IS INCORPORATED

THE IRON AND STEEL TRADES JOURNAL

VOL. 41. Thursday, September 26, 1929. No. 684.

PUBLISHED WEEKLY.

Subscription Terms: 15s. per annum.
Foreign and Colonial: 17s. 6d. per annum.
All Subscriptions are payable in advance.

All Communications to be addressed to the Editor, or to the Publisher, as the case may be, of

THE FOUNDRY TRADE JOURNAL,
49, WELLINGTON STREET, LONDON, W.C.2.

Telegraphic Address: "Zacatecas, Rand, London."
Telephone: Temple Bar 3951 (4 lines).

Contents.

	PAGE
Forthcoming Events	219
An Excellent Habit	219
The Birth of Stainless Steel	219
Correspondence	220
Foundrymen at Olympia	220
British Industries Fair	220
Random Shots	220
The Seven Cardinal Sins of the Foundry	221
Catalogues Received	221
Iron in Antiquity	222
German Foundry Exhibition	223
Baking Practice for Oil-Sand Cores	224
The New Foundry of Morris Motors, Limited	225
The Importance of the Rhenish-Westphalian Foundry Industry	230
The Basic-Bessemer Process of Steelmaking	231
Reports and Dividends	231
Lancashire Foundrymen visit Altham Coke Ovens	232
National Industrial Safety Congress in Sheffield	232
Trade Talk	234
Contracts Open	234
Personal	234
Obituary	234
Iron and Steel Markets	235
Book Review	236

THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

Institute of British Foundrymen.

PRESIDENT: 1929-30:

Wesley Lambert,
J. Stone & Company, Limited, Deptford, London, S.E.14.

LIST OF SECRETARIES—

General Secretary: T. Makemson, Saint John Street Chambers, Deansgate, Manchester. London Office: 49, Wellington Street, London, W.C.2.

Birmingham: F. K. Neath, 24, St. Paul's Square, Birmingham.

Sheffield: T. R. Walker, 26, Castlewood Road, Pulwood, Sheffield.

Scottish: J. Bell, 60, St. Enoch Square, Glasgow.

Lancashire: H. Stead, 1st/36, Cheetham Hill Road, Stalybridge, Cheshire.

London: H. G. Sommerfield, Charterhouse Chambers, Charterhouse Square, London, E.C.1.

Newcastle-on-Tyne: F. Sanderson, 15, Handyside Arcade, Newcastle-on-Tyne.

East Midlands: H. Bunting, 82, Otter Street, Derby.

West Riding of Yorkshire Branch: S. W. Wise, 110, Pullan Avenue, Eccleshill, Bradford.

Wales and Monmouth Branch: J. J. McClelland, M.I.Mech.E., Druslyn, Bishops Road, Whitechurch, Glam.

Middlesbrough: F. A. Harper, "The Briars," Bishopton Road, Stockton-on-Tees.

Foundry Trades Equipment and Supplies Association.

President: H. Winterton, Kelvinvale Mills, Maryhill, Glasgow.

Secretary: K. W. Bridges, Avenue Chambers, Southampton Row, London, W.C.1.

Welsh Engineers' and Founders' Association.

Secretary: E. J. Griffiths, 20, Fisher Street, Swansea.

BRITISH CAST IRON RESEARCH ASSOCIATION.

The Registered Office and Laboratories of the B.C.I.R.A. are at :—
24, ST. PAUL'S SQUARE, BIRMINGHAM.
Telephone: Central 1846. Telegrams: CIRA.
The B.C.I.R.A. Scottish Laboratories are :—
Foundry Technical Institute, Meek's Road, Falkirk *(Telephone 332).*

Forthcoming Events.

SEPTEMBER 12-28.
Shipping, Engineering and Machinery Exhibition at Olympia, London.

Institute of British Foundrymen.

SEPTEMBER 27.
Sheffield and District Branch:—Presidential address and discussion, followed by a smoking concert.

OCTOBER 4.
Lancashire Branch:—Opening meeting at Manchester. E. Longden will deliver his presidential address, to be followed by an open discussion.

An Excellent Habit.

This month has been characterised by a number of conferences and other co-operative activities, some of them taking place out of England, and it therefore appears pertinent to point out at the present time the increasing number of technical and business men who participate in such events and the great value of that participation. Our friends on the Continent and in America have long subscribed to the theory of progress by conferences, in part perhaps because the greater distances that separate them make unorganised contacts very rare, but we in England have been slow to follow, for the very reasons that make it especially desirable for us to do so. For the average Englishman, and the average English foundryman no less than the rest, is both individualistic and reticent. It is his way to work out his own salvation and tell no one about it. When, therefore, he is presented with the programme of some such event as these already referred to, he considers the direct practical utility to himself of the Papers to be discussed or the visits to be made, and if this value does not strike him as being very considerable indeed he probably consigns the programme to the waste-paper basket. Yet even the most individualistic and the most reticent of men, having participated a time or two in some such gathering, will confess that its value is in no way limited to these more obvious aspects. For the difficulty under which the Englishman labours is his inability to "open out" to anyone unless they have something in common with him—unless they play golf together or belong to the same "lodge." The fact that they spend their working lives facing the same problems and superintending the same processes does not as a rule constitute such a tie—at home. But take these same men and set them down somewhere else—and especially is this so in a foreign city—and the fact that both of them are foundrymen will instantly constitute a bond of the closest description. Under such conditions it is the likenesses and not the differences that emerge. Your reticent and individualistic Englishman begins to "open out," to discuss his own problems and other people's, to explore possibilities for their solution, and so on. It may be asked, is this in itself of any great value, apart from the fact that it sugars the pill of hard work that has to be got through on these occasions. Emphatically it is of great value. For the need in British industry to-day is for men to get together. To-day in industry, and especially in founding, the battle is to the strong, and the strong are those who will combine easily and whole-heartedly and effectively to meet both their technical and their commercial problems. Our foreign competitors have behind them a tradition of getting together in bureaucratic and military organisation; they organise easily. We have no such tradition and we organise badly. If, therefore, we are to maintain our place among the nations, we must make for ourselves some such tradition, and what better than the habit of getting together and "opening out" under the stimulating influence of a conference or a foreign visit?

The Birth of Stainless Steel.

Mr. Kuehnrich's letter to the Solingen (Germany) Press, reproduced a fortnight ago in our columns, is worthy of comment from several angles. It can be regarded as a spirited defence of British stainless steel interests in general in Germany. It can also be taken as a claim that the first manufacturer of high-chromium steel was the inventor of stainless steel, and, moreover, there is the claim that Mr. Kuehnrich himself was, as the first producer of high-chromium steel, the true inventor of stainless steel. Finally, the letter contains, to our minds, an unwarrantable attack on the existing state of the art in stainless cutlery manufacture.

Dealing with these phases *seriatim*, we appreciate Mr. Kuehnrich's fight for British interests, but the letter is too long, brings in too much extraneous matter, and, by referring to British material as being poor, has damaged both his own and the British position in general. Co-operative action by all concerned would have been preferable.

As a metallurgist, we fail entirely to see the connection between the bulk of high-chromium steel and stainless steel. They certainly both carried a high percentage of chromium, but magnet steel and high-speed steel both carry high percentages of tungsten, yet obviously they are totally different. Presuming for a moment that high-chromium steel was the forerunner of stainless steel, we assert that it would be difficult to say who made the first experiments incorporating large quantities of chromium. The argument as the natural discovery that such material would be stainless through the existence of the micro-sections is not valid, as most highly-polished material is less liable to attack than material not so treated.

We consider that Mr. Kuehnrich's comments on stainless cutlery (except the very earliest types) unjustified. Providing the blades have been forged reasonably thin and that about half an inch on the curve is periodically steeled (this does not apply to carvers), excellent service can be assured. This point can be demonstrated by taking an ordinary sharp penknife, shaving one's arm with the point section, then carving up a cigar box by using the section near the haft, and then once again using the point section for shaving. Plain cutlery has a century of experience at its back, and yet, with a bare after-war period of testing, the best of stainless is infinitely superior to its older rival, even in cutting properties. We have handled Mr. Kuehnrich's new products, and we believe they come into this last category.

XUM

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Casting Temperature and Chill Cast Iron.

To the Editor of The Foundry Trade Journal.

Sir,—Since coming to Japan as consulting metallurgist for the largest roll manufacturers here, I have been a reader of your Journal, and have derived much benefit therefrom, but the article "Casting Temperature and Chill Cast Iron," by F. Busse, appearing in your issue of July 25, is rather misleading, at least from my experience.

Mr. Busse gives his results after inspecting four hundred rolls, and may I say that I have inspected forty thousand rolls, from the smallest to the largest made under my supervision, and I have never produced a good roll that was poured at so low a temperature as Mr. Busse suggests for his maximum temperature of 1,300 deg. C.

When I say "good roll," I mean a roll that gives sixty or more days' service, finishing, in the mill. It may be that Mr. Busse has a correction for his pyrometer.—Yours, etc.,

Geo. H. Aupperl,
Consulting Metallurgist.

The Tobatta Foundry Company, Limited,
Wakamatsu Works,
Wakamatsu, Fukuoka-Ken.
September 3, 1929.

Foundrymen at Olympia.

Messrs. F. W. Bridges & Sons, the organisers of the Shipping, Engineering and Machinery Exhibition, were the hosts of the Institute of British Foundrymen last Saturday. The Council were entertained to luncheon and the whole body of the members to tea. Mr. Wesley Lambert, the President of the Institute, in proposing a vote of thanks to Mr. Bridges, said that the exhibition possessed features of outstanding interest to the foundrymen, as the machinery exhibited consisted of an aggregation of castings, so far as the static elements were concerned.

Mr. K. W. Bridges was called upon to reply, and took the opportunity of thanking the Institute for the close collaboration they had accorded him, and which association had done so much towards assuring the success of the recent Foundry Exhibition. His contacts with the foundry industry he valued above all others on account of the spirit of good sense and comradeship they invariably exhibited.

Last Monday, the British Cast Iron Research Association and the Institute of Metals were similarly entertained, whilst to-day there is to be a meeting of the Council of the Foundry Trades Equipment Supplies Association at Olympia.

Clyde Trust Official's Tour.

Impressions of a recent tour of the Dominions were given in Glasgow by Mr. Harold M. Ford, secretary of the Clyde Trust. Referring to the rapid growth of New Zealand, Mr. Ford said that practically all the bridges in that country were of wood, but that in view of the growth of rail and motor traffic these would have soon to be replaced by concrete and steel.

This, he said, offered a good opportunity to Scottish firms. If they wanted work they would have to go out and get it.

One make of Scottish motor-lorry was stated by people in Australia to be ideally suited to their climate and conditions of work, but there was a deficiency of depôts where spare parts could be obtained. American makers, on the other hand, had a plentiful supply of depôts, and on that account were given a preference.

British Industries Fair.

Exhibitors and trade buyers alike will find important additions to the arrangements for their comfort and convenience at the forthcoming British Industries Fair, to take place in Birmingham next February.

Among the developments for the 1930 Heavy Section is an entirely new building, now in course of construction, on the north side of the present 11-acre Fair. This will comprise a dining-room specially for exhibitors, another for trade buyers, a large conference hall, and a series of private dining-rooms for the use of the numerous trade and professional societies and institutions which have made it their practice for many years to foregather at the Birmingham display.

Two spacious passages, each 72 ft. by 40 ft., connecting the new block with the main building, will be arranged and furnished as comfortable lounges for exhibitors and their visitors, the whole occupying over an acre.

The plan of rearrangement now decided upon has the further advantage of solving—for the present, at any rate—the problem of the ever-increasing demands for space made by exhibitors in the engineering, gas and general hardware sections of the heavy fair.

Exhibitors at the Heavy Industries Fair, appreciating the progressive policy of the Birmingham Chamber of Commerce (Inc.) in erecting permanent new buildings to the limits of the original site, will be particularly interested in the announcement made to-day that negotiations are practically completed for the acquisition of a further 15 acres of land immediately adjoining—an enterprise which will permit of expansions year by year, as circumstances demand, to an aggregate of nearly one and a half times its present immense size.

Stand lettings in Birmingham for 1930 have already beaten all previous records, nearly the whole of the accommodation, including the year's extensions, having been booked six months in advance of the opening date—February 17.

Uses for Grey-Iron Castings.

The Grey Iron Institute, of Terminal Tower Building, Cleveland, America, has distributed amongst its members a book indicating over 2,000 uses for grey-iron castings. This publication will be particularly helpful to members in checking the outlet for their products and expanding uses for each individual company's castings.

A. J. Tuscany, the Institute manager, states that the Grey Iron Institute has completed arrangements through which it will be possible to present to users of castings and others having contact with grey iron, information on the proper uses as well as properties of grey iron for different conditions. One phase of this work will consist of addresses before groups of industrialists, engineering societies, technical bodies, national and local organisations; in short, anyone interested in, or having contact with, grey iron.

Some of America's leading metallurgists have consented to work with the Grey Iron Institute in this activity.

St. Dunstan's.

"Fifteen Years After" is the title under which the 14th Annual Report of the St. Dunstan's Organisation is published. It indicates that if the existing support is continued it will be in a position to be self-supporting after fifteen years, as this would enable the very desirable measure of adequately endowing every blinded soldier for the rest of his life being undertaken. We are aware that many of our friends in the foundry industry have supported St. Dunstan's in the past and we appeal to them to continue to help the work of this excellent institution.

Random Shots.

I feel I must keep my word and write about the Düsseldorf Foundry Exhibition, in spite of the space that has already been devoted to the subject—and perhaps what I have to say will be the better for having had the longer in which to mature. The impressions made by an event of this kind are apt to be too overwhelming at first to be entirely just—it requires a week or so of concentrated reflection to see things in proper perspective. Those of you who were not there will, I am sure, be glad to hear a little more than could be conveniently gleaned from official reports and catalogues, and those of you who *were* there will no doubt enjoy telling your friends that my remarks are all wrong—or all right, as the case may be.

* * *

And in the first place, a word as to the setting. Those of you who saw the film "Metropolis" a year or so ago will have some conception of German modernist art and architecture, and of this, suitably modified to meet practical requirements, the Exhibition Buildings were an impressive example. Nor did the interior fail to rise to the occasion. There was a handsome entrance hall, and it was interesting to note that three of the four large-scale foundry photographs on its walls were of plants visited by the Cast Iron Research Association party. There was a flowery courtyard, complete with café and loud speaker, and on one notable occasion with a supply of much-appreciated and almost too excellent "Rheinwein." There was a magnificent display of decorative ironwork, ranging from 17th-century ovenplates to modern silhouette plaques. There were mural paintings, portraits of distinguished technical and practical foundrymen, charts, advertisements, everything possible to make less fatiguing to eye and brain the immense array of technical and commercial exhibits.

* * *

These technical and commercial exhibits were arranged on either side of the entrance, with a large Machine Hall at the back. In the latter the great majority of the exhibits could be seen at work. This in itself was a notable point, but equally notable was the number of models—working, pictorial and stationary; models of cupolas and furnaces and mechanical devices, demonstrations of labour-saving methods, of relative costs, and so on.

* * *

Probably, however, the most striking feature of the Exhibition was its sheer extent, or, rather, the extent of the material contained within its limits. Those who were at first inclined to think a day and a half too generous an allowance of time for its inspection soon changed their minds. Yet, in spite of its extent, the Exhibition was obviously and emphatically built up around the central idea of Economy in Foundry Practice, and no opportunity was lost of emphasising the fact.

* * *

It was, perhaps, fortunate that the Exhibition closed at 7 p.m. Had it been otherwise the foundrymen who visited Düsseldorf might well have come home sadder, but certainly not wiser, men. (Unless they had chosen the alternative of doing entirely without sleep.) Enough has already been said—and rumoured—anent the after-hours activities of the foundryman abroad to make it clear that this lamentably early closing did not involve any serious waste of time. . . .

Marksman.

The Seven Cardinal Sins of the Foundry.

No. 1.

At the German Foundry Exhibition, and in a small room leading from the main machinery hall and a smaller one devoted to rationalisation, the panels were decorated with seven pictures representing the seven cardinal sins encountered in foundry practice. The first is entitled "'Midst Dark and Dampness"; the second, "The Moulder as an Unskilled Labourer"; the third, "Few Moulds Enter, Much Heat Leaves"; the fourth (below), "Twenty per cent. Coke and Still Dull Iron"; the fifth, "Old Methods and Efficiency are Not Synonymous"; the sixth, "How the Scrap Pile Accumulates"; and the seventh, "The Neglected Fettling Shop." The message these pictures carry was the underlying principle for the spirit in which the Exhibition was presented to the general public and foundry specialists.

The pictures were on sale at the Exhibition in the form of postcards, and those who would like copies should make application to the offices of "Die Giesserei," 27, Breitestrasse, Düsseldorf. We feel sure that the message they bear would be helpful in creating in the minds of foundry executives an inspiration for the elimination of waste in the departments under their control. Moreover, they possess considerable artistic merit. The artist, Oskar Detering, is a well-known local artist, whose work is much appreciated in German art circles. We have to thank Dr. Ing. Geilenkirchen for according permission for their reproduction.

No. 5.

No. 2.

No. 6.

No. 3.

No. 4.

No. 7.

Catalogues Received.

Sand Testing.—Messrs. O.V.A.L. (Office de Verreries et d'Appareils de Laboratoire), 107, Boulevard Lefebvre, Paris (15ème), have sent us a four-page leaflet (in French) detailing the apparatus and method used for the physics mechanical examination of foundry sand. The apparatus is that designed by Monsieur Gramme, a prominent personality in French foundry circles.

Melting Furnaces.—We have received from Messrs. Penicud & Company, of 3, Victor Hugo-Bagnolet (Seine), France, a 24-page well-illustrated catalogue outlining a range of melting furnaces. The range includes the tilting oil- and coke-fired crucible furnaces of a 100 to 250 lbs. capacity. The lining is effected by the insertion of complete rings which cuts out all vertical joints and saves time when relining. On page 13, a tilting reverberatory furnace is described and illustrated. On a bronze basis the six sizes indicated cover a range of from 10 cwts. to 5 tons. The furnace is fired with heavy tar oils. The last section deals with a line of laboratory melting furnaces. They have a weight range from 10 to 25 lbs. and are designed to carry from 1 to 5 crucibles, are oil-fired and are stated to be capable of giving temperatures up to 1,500 deg. C. The catalogue is written in French. As recently announced, the Universal System of Machine Moulding & Machinery Company, Limited, of Wilson Street, London, E.C., have been appointed sole British agents for these furnaces.

Iron in Antiquity.*

By T. A. Rickard (Berkeley, California).

(*Abstract.*)

The most portentous event in the development of human industry was the discovery of iron—that is, the purposeful production of the metal from its ore. Man's first use of the principal industrial metal is wrapped in obscurity, partly because the archæologic study of the subject has been confused by the failure to distinguish between man-made and heaven-sent iron.

Montelius has expressed the opinion that man-made iron was rare so late as the eighteenth dynasty (1580-1350 B.C.), and he appears to be more than justified. Petrie asserts that no iron was "intelligently produced by an understood process as a regular manufacture" before 1200 B.C. That was the date of the Libyan invasion, when the Egyptians captured 9,000 bronze swords, "showing that iron was not usual," as Petrie remarks. The same veteran archæologist has remarked to the author that there is no satisfactory evidence of the industrial use of iron in Egypt before 800 B.C. The idea has been advanced, by Tylor, for example, that iron was made occasionally by chance in sundry places in a camp fire, a forest fire, or even by a stroke of lightning; and that thus stray pieces of metal came into use among primitive peoples long before the beginning of the so-called Iron Age.

The age of iron did not begin until the metal was sufficiently plentiful to be put to industrial use; the employment of stray pieces of iron, however, obtained, as jewellery does not constitute a distinct stage of metal culture. The discrepancies of chronology are enormous—no less than three millenniums. The assumption is made that iron was produced in Egypt so early as 3500 B.C., although not known in Europe until 1000 B.C., the inference being that this critical discovery could be kept secret for 2,500 years even when there was communication by trade, though slow; or are we asked to infer that the primitive Europeans were relatively so unintelligent as to ignore the fabrication of a metal so supremely useful?

The earliest recorded use of iron in China goes back only to 722 B.C. We learn that in 685 B.C. copper was still being used for the making of swords and spears, while hoes and hatchets were made of iron. As for India, iron is mentioned several times in the Atharvaveda, the latest of the four Vedas, the period being 1200-1000 B.C.

A Hittite text of the fourteenth century B.C. speaks of "black iron of heaven from the sky." Such also appears to have been the early iron of Egypt and of Assyria. This opinion has been expressed by Georg Möller and Ludwig Beck. Much evidence, besides inherent probability, sustains the belief. In the Pyramid texts, belonging to the period extending from the fifth to the seventh dynasties (2750-2450 B.C.), iron is mentioned as a heavenly metal, the word used being *bia-n-pet*, meaning "metal of heaven." Moreover, *bia-n-ta*, meaning "metal of earth," appears in a late inscription at Denderah, as if to distinguish terrestrial from celestial iron. That, perhaps, was why in the earlier inscriptions it was painted blue. The Sumerian word for iron, *an-bar*, signifying "sky-fire," warrants the same inference.

All the iron relics of remote antiquity should be analysed to determine their nickel content, which is the criterion for their meteoric origin. Celestial iron normally contains from 5 to 26 per cent. of nickel, a rough average being 7½ per cent., together with some cobalt, from a trace to 3½ per cent. On the other hand terrestrial ore rarely contains nickel, and then only in small proportion; for example, the Cuban ores contain from 0.55 to 0.8 per cent. of nickel, together with 1.17 to 1.51 per cent. of chromium. Even a concentration, by smelting, of three into one would give a maximum nickel content of only about 2½ per cent.

Iron does not appear frequently in Egypt until between the twenty-second and twenty-fifth dynasties—that is, between 945 and 718 B.C. The heaps of iron slag at Meroe and elsewhere in Ethiopia belong, says Petrie, to the period from 700 B.C. onward.

Various opinions have been pronounced concerning the amount of skill required to smelt iron. It has been urged—by Percy for example—that the use of iron must have preceded that of copper, because iron can be reduced at a lower temperature than copper. Percy states: "From suitable ore, of which abundant and readily accessible supplies exist in various localities, nothing more easy can be conceived than the extraction of malleable iron. Of all metallurgical processes it may be regarded as the most simple. Thus, if a lump of red or brown hematite be heated for a few hours in a charcoal fire, well surrounded by, or embedded in, the fuel, it will be *more or less* completely reduced, so as to admit of being *easily* forged at a red heat into a bar of iron." (The italics are the author's.) He continues: "The primitive method of extracting good malleable iron directly from the ore, which is still practised in India and in Africa, requires a degree of skill very far inferior to that which is implied in the manufacture of bronze."

A primitive performance of the kind sketched by Percy would result most probably in an incomplete reduction, yielding a metallurgic abortion not likely to be recognised as a piece of useful metal. Nor would it be "easily" forged, because our primitive operator would have no tongs wherewith to hold it "at a red heat" while he hammered it. The professor simply writes in terms of his own knowledge, and overlooks the ignorance and stupidity of primitive man. Berthelot, on the other hand, says that the delay in the use of iron is not surprising, because, however numerous the deposits of ore, the extraction of the metal by smelting is a difficult operation, and one not to be performed by a people lacking some degree of trained intelligence. This is the information that the metallurgist must give to the archæologist.

The temperature of any of the primitive metallurgical hearths, whether in East Africa to-day or in Asia Minor more than two thousand years ago, was not high enough to melt the iron, nor did it suffice to cause the pasty globules of metal to stick together, save in a spongy form, unfit for immediate use. Much laborious hammering was needed to close the pores and to change the texture to that of a hard and coherent metal.

The art of iron-making did not originate in the valley of the Nile, nor in the valley of the Euphrates, for neither was a mining region. The original home of metallurgy in the ancient world appears to have been the mountainous country between the Caspian and the Black Seas. The myths retailed by the Greek historians point that way; so does Hebrew tradition, as exemplified by the tale of Tubal, the smith. The Dactyli, the Chalybes, the Phrygians, the Amorites, and the Hittites are links in the story of prehistoric metal culture.

The first metal founders were men of the mountains; the Assyrians drew their metals from the Caucasus; the Hittites brought iron into Syria; Armenia and Cappadocia were the sources of the metallurgic art; the Philistines brought it thence into Palestine; and it is there, in the Biblical land, that the oldest man-made iron has been discovered recently by that honoured veteran, Sir Flinders Petrie. In a mound at Gerar, about nine miles from Gaza, in 1927, he found iron-smelting furnaces, together with agricultural implements, all of which had been made on the spot. These have been dated by means of contemporaneous scarabs and amulets of Egyptian origin. Some iron knives are believed to go back to 1350 B.C., and the remains of furnaces to the days of Rameses II, or 1194 B.C.

The most significant evidence is that of a real beginning of the smelting of iron for the fabrication of useful tools, such as hoes, sickles, and plough-points in 1200 B.C. The first production of iron appears to be linked with the Anatolian area, and the use of it industrially is connected with the extension of the Hittite power into the Syrian lowlands, after 1400 B.C. The discovery of the art of smelting iron may be attributable to the tribes bordering upon Cappadocia and in the foothills of the Caucasus, where it is possible that even at an early stage of iron smelting the chance admixture of manganese may have yielded a metal of remarkable excellence. The widening use of iron was probably associated with the disintegration of the Hittite empire. Such is the information available at this time concerning the earliest iron made by man from terrestrial ore.

* A Paper read before the Autumn Meeting of the Iron and Steel Institute.

Foremen Engineers to visit Coventry.

During the Glasgow Autumn holiday week-end, the Glasgow and West of Scotland Association of Foremen Engineers and Draughtsmen have arranged to visit Coventry, on the invitation of Sir Alfred Herbert, and to inspect the works of Messrs. Alfred Herbert, Limited, which are described as the largest and best-equipped machine-tool works in the world. The members will leave Glasgow next Saturday, and on the following day Sir Alfred Herbert has arranged for the party to motor to places of interest around Coventry. On Monday both forenoon and afternoon will be spent in inspecting the works of Alfred Herbert, Limited. The party will leave Coventry on Monday evening for Glasgow.

Reflections on Düsseldorf.

The Düsseldorf party were delighted to have with them Mr. John Cameron, J.P., one of the most popular amongst the past-presidents of the Institute of British Foundrymen. In his capable hands was left the task of thanking the hosts for the many kindnesses extended to their guests, and we take this opportunity of reiterating, on behalf of the B.C.I.R.A. members and the considerable numbers of founders who went alone, the words of thanks so admirably chosen by Mr. Cameron.

The party was very pleased that Mrs. Pearce was present, as it indicated in a practical form that she had made great progress towards recovery from her recent serious illness.

Record Glasgow Locomotive.

The largest oil-electric locomotive in the world, manufactured by a Glasgow firm, is now in operation on the Canadian National Railway system. Its effectiveness was recently demonstrated in an experimental run from Montreal to Toronto. This engine weighs 310 tons and is 94 ft. long overall. Oil fuel is used to operate the engine which drives the electric generator, and this generator furnishes the electric energy for the propulsion motors.

The Trans-Canada run was made in exactly 67 hours, which broke all speed records to the Pacific coast.

German Foundry Exhibition.

This account does not pretend to be a complete story of all that was shown at the Düsseldorf Exhibition, rather is it a rapid review of the high lights as they appeared to one who has had the good fortune to inspect almost every foundry exhibition held in Europe for the last nine years.

We are conscious of the limitations existing in the various countries, and even the Düsseldorf Exhibition suffered in some measure because about half-a-dozen of the very largest manufacturers of foundry plant refused to take space on account of its long duration—three weeks. They felt that 10 or 12 days would be ample. But an examination of the other side of the question reveals that a large number of the professor type had been working hard for three years to create a crystallised exhibit of some point of paramount importance, and to show it for an attenuated period would hardly justify the efforts made.

Entrance Hall.

Here were installed on pillars eight dioramas representing the development of the industry from 1500 to 1890, which last showed the first foundry to utilise a conveyor for continuous working. Round the walls were four large photographs, about 21 ft. × 9 ft., showing (1) the foundry of the Motorenfabrik Deutz; (2) the continuous production foundry at Gelsenkirchen; (3) the pipe foundry in the same establishment, and (4) the Chevrolet foundry of General Motors at Saginaw (U.S.A.). It is interesting to note that the B.C.I.R.A. members had the opportunity of visiting the first three.

Educational Exhibits.

Room No. 1 and its lobby were devoted to the showing of a number of old prints illustrating the development of the industry from the earliest times, as well as a number of antique castings, such as firebacks and the like. A representative collection of pictures of the leaders of thought in the German foundry industry since the earliest times formed an inspiration for youth to seek inclusion in the future.

In Room No. 43 we were impressed by a number of wall charts, which chronologically identified the developments of the foundry industry with their creators, such as 1895, Professor Turner "Discovered the Influence of Silicon on Cast Iron," and 1690, "Wilkinson Invented the Cupola." We should not be surprised if these went before an international committee there might be a "flutter in the dovecotes," but we admire the courage of the management in doing so much in this direction—the charts form a real sound basis for historical research into foundry evolution.

Room 42, which was devoted to mechanical testing, had been arranged by Prof. Dr. Ing. Rudeloff, whose death, to the universal regret of foundrymen, took place just before the opening of the Exhibition. Here were displayed every type of testing machine currently used in foundry practice. Quite a number of rooms were devoted to the chemical and micrographical analyses and pyrometry and thermal investigations, whilst in a near-by room there was installed a complete X-ray apparatus.

In Room 41 an effort had been made to show the development of cast iron as a commercial material, and classification charts were shown outlining its rôle in the other industries. Two fair-sized rooms were taken up by a well-collated exhibit dealing with malleable cast iron, both white and black heart. Specimens, diagrams and models were all utilised to show the development and properties of malleable iron and the influence of various elements on its properties. Right and wrong methods of operations were graphically illustrated. The pattern-making department was splendidly displayed in a large room. Here advantage was taken of showing the moulder's view-point by indicating very clearly where and how so many of the patterns supplied to them were bad.

The next section we visited was confined to sands. Samples of available supplies, their classification and testing for ascertaining their suitability for foundry use, were intelligently arranged and demonstrated.

Metallic and other moulds which were exhibited in Room No. 24 covered the whole question of die castings.

One of the most important exhibits was housed in Room 29. It dealt in a very complete manner with sand preparation, moulding and core making. An analogous exhibit in an adjoining room showed the principles and development of machine moulding.

The next feature to be dealt with was the drying of cores and moulds. Here the whole history of the subject was set out; models showed the various types of ovens that have been or are used, whilst the last exhibit indicated exactly where economies were to be sought. The cleaning of castings was similarly developed by taking the subject right from the old hammer and chisel method to the high pressure water-jet system.

An important section, mainly covered by wall charts, was devoted to after-treatment of castings, enamelling and the like.

Perhaps the section which was the most graphically handled of all was the "Transport" or "Handling" exhibit. Models connected by red tape to wall charts indicated the essential movements of materials for the making of castings, and these were followed up by further charts and models showing the influence of layout on transport costs—where economies could be effected, and so on.

The best exhibits, to our mind, were those arranged by Mr. Langenohl, treating of the theory and practice of the movement of materials in foundry practice.

Melting Practice.

Under the caption of "The Cupola and Its Rational Working," the organisers had collected models and drawings of any and every type of cupola since the time of Wilkinson, and showed to good advantage what happened inside the furnace, how it should and could be blown. Accompanying these were a series of attractive models showing the development, construction and operating details of the reverberatory, crucible and electric furnaces. Old and modern ladles were a supplementary exhibit in this section.

Continuous Working.

In a large hall an attempt was made to show just what is meant by "Fliessarbeit," or continuous working. There was the large-scale working model of the Citroën foundry in Paris, Along one side there was a line of moulding machines working over a shaking conveyor, which transported the sand back to the preparing plant. The sand for the moulders was taken from containers transported by Lister trucks. Here was a weakness, as it is not easy to dig sand out of a high-walled box, but we believe that some of the original arrangements failed to mature. In this hall a fair amount of space was devoted to "Safety-first" propaganda, and to "Vocational and Physical Suitability." Beyond an appreciation of the underlying principles of vocational suitability, we have not the slightest belief in its practical utility to the British foundry industry, and we confess to no little surprise when Dr. Werner assured us that his various undertakings had benefited considerably by subjecting all applicants for positions and entrants to the industry to vocational suitability tests. These tests, as shown at the exhibition, were of the hanging of numbered discs on to numbered hooks; the winding of string on to numbered nails from a list supplied; the steering of a pencil by means of two handles giving a rectilinear command so as to draw circles, and so on. We hope to give our views on this question editorially in the near future.

Non-Ferrous.

A fairly large hall was devoted to a survey of the non-ferrous foundry industry. Beyond a striking story about the development of beryllium, we received the impression that the development in Germany was much the same as here.

Commercial Exhibits.

It is not our intention to detail the various exhibits coming under this heading, but merely to indicate developments which are new or novel so far as the majority of Britishers are concerned.

In cupola practice the only novelty we noticed was a model carrying a series of water injectors through the blast belt. How this effects any economy we fail to appreciate at the moment, and await with interest the results of practical tests. An ingenious mechanical cupola tapping arrangement was exhibited by the Werner concern. Types of rotary furnaces were well represented. There was an excellent model of the Brackelsberg furnace, a model designed to show the movement of the metal in the eccentrically-disposed "Buess," and a rotary oil- and gas-fired furnace mainly conceived for non-ferrous melting.

Amongst moulding equipment, a new form of sand-slinger was shown by the Franz K. Axmann concern. It rams 8 to 9 cub. yds. an hour and uses a 10-h.p. motor. A useful double moulding machine, to be worked by one man only, was shown by Herring & Son, whilst a boxless, hand-operated machine of a portable type, made by Universal Werkzeugmaschen und Apparatbau G.m.b.H., created favourable comment amongst the visitors. A number of good jar-ramming machines, one a hand-jar machine for cores, and small moulds up to 45 lbs., showed that the German engineers have carefully studied ease of working so far as the disposition of levers and the like is concerned. Alfred Gutmann was showing a new type of sand-blast machine, which consists essentially of a slab conveyor which takes the castings a bare foot in an almost vertical direction, when they fall back on to the incoming stream of castings. The whole time a jet of sand is playing on the moving mass, whilst the whole is roller-shutter enclosed and at a convenient height for loading. Actually, this was by the American Foundry Equipment Company.

One of the most interesting exhibits was shown by Carl Rein. It consisted of an attempt to solve the vibration problem when transporting cores in the green sand state. At the new Morris Works at Coventry, Messrs. Bagshawe achieved success by the introduction of springs into a pendulum conveyor system. Rein, by means of a model, proposes to suspend a series of pendulum conveyors from floats riding in a water channel, the rush of the water forming the motive power.

The firm of Gustav Lohbeck (Mulheim-Ruhr) showed a very nice hand-operated box transporter. The carrier is two-wheeled and is provided with sides the top of which form two bearings for the easy engagement with a pair of trunnions attached to the sides of the boxes.

Amongst the smaller "gadgets" shown was a bracket suitable for use in the construction of core racks or pattern stores. Attached to an inch-round vertical rod, the bracket could be raised or lowered with the greatest ease by merely forming an angle of 45 deg., whilst returning to the horizontal firmly fixed it in any position.

Baking Practice for Oil-Sand Cores.*

By H. L. Campbell (Ann Arbor, Mich.).

The practice used in baking oil-sand cores may be controlled effectively when all of the changes which take place during the baking period are thoroughly understood. In order to obtain full advantage of the oil binder which is used in the core-sand mixtures, the baking practice must be regulated so as to produce the maximum physical properties in the cores. The chief factors which affect the properties of the finished cores are the time of baking, temperature used, and the atmospheric conditions within the oven.

This discussion on baking practice relates only to cores which are prepared with raw linseed oil. This oil is a complex chemical compound obtained from flaxseed. It is classified as a "drying oil" because it hardens by taking up oxygen from the air. When used in paint and varnish, its property of forming a hard, tenacious coating is well known. The oxidation of linseed oil is accelerated when it is heated in contact with air. At temperatures below 180 deg. C. (350 deg. Fah.) the hardening of the oil film proceeds relatively slowly. As the temperature is raised from 180 to 230 deg. C. (350 to 450 deg. Fah.), the increased rate of reaction between oil and oxygen is very pronounced. Temperatures above 260 deg. C. (500 deg. Fah.) destroy the oil film, and will therefore cause a rapid deterioration in the strength of cores bonded with raw linseed oil.

The constitution and structure of oil-sand cores are not favourable to the rapid heating of the cores from room temperature to the desired baking temperature. The heat conductivity of silica sand is relatively low, and the porous structure of all oil-sand cores retards the conduction of heat through the cores.

In core mixtures containing only linseed oil and sand, very little bond exists between the sand grains before the cores are baked. In order to increase the bond in the sand mixtures, so that various shapes may be readily produced, water is added to the amount of about 4 per cent. of the volume of the sand. In some practice a mineral oil thinner such as naphtha is used with the linseed oil to aid in distributing the drying oil throughout the sand. The evaporation of moisture and the distillation of volatile oils from the cores may necessitate the use of considerable heat.

A thorough mixing of the components in each batch of core sand is essential to the production of cores having uniform properties. After forming the core-sand mixtures into the desired shapes, the cores are placed in ovens to harden the oil binder and thereby to strengthen the cores.

Changes during the Baking Period.

With the aid of special oven equipment, a thorough study was made of the changes which take place during the baking of oil-sand cores. The total time the cores are in the baking oven may be divided into three periods; first, the "heating up" period; second, the "evaporation" period; and third, the "oxidation" period. While the different periods in the total baking time for oil-sand cores may be definitely observed in a small oven with cores of relatively small cross-section, these divisions of the baking period will overlap to some extent in the case of cores having large cross-sections.

During the "heating up" period, the temperature of the cores and core plates is raised from room temperature to the temperature at which moisture or other volatilised products are driven from the cores. The length of this period is dependent upon the temperature of the oven as well as on the rate at which heat is supplied to the oven. In addition to heating the cores, it is necessary to heat all of the ironwork which is placed in the oven with the cores.

The permeability of oil-sand cores has been found to be greater after baking than before. This increase in permeability assists in the removal of the volatile constituents from oil-sand cores. Due to the relatively slow conductivity of heat through the cores, and due to the provision for the removal of gases which are generated in the cores during baking, there is no possibility of cores being destroyed when subjected to maximum baking temperatures within the core oven.

The "evaporation" period is the interval during which moisture is removed from the cores. The temperature of the cores remains practically constant during this period. If a core-sand mixture contains a light, mineral oil in addition to moisture, the range of temperature for the "evaporation" period may be extended until the mineral oil has been distilled off. The removal of the volatile products from the cores will be hastened by providing a supply of hot, dry air to the oven during the "evaporation" period.

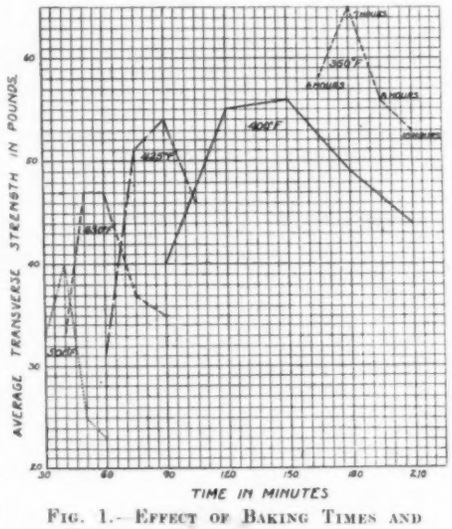


Fig. 1.—Effect of Baking Times and Temperatures upon the Strength of Cores.

The "oxidation" period is that part of the total baking time during which the cores become hardened or strengthened. At the end of the "evaporation" period, the cores will be practically as soft as the core-sand mixture from which they were made. The rate of oxidation increases noticeably at temperatures from 180 to 230 deg. C. (350 to 450 deg. Fah.). The presence of oxygen is essential to the hardening process. During the "oxidation" period gaseous products and smoke are given off from the cores. These products, which accompany the oxidation of linseed oil, have a tendency to retard complete oxidation of the oil. Therefore, it is important that these gases be removed from the core oven as rapidly as they are formed.

Effects of Temperature and Time of Baking on the Strength of Cores.

In order to establish the most satisfactory baking practice for oil-sand cores, it is necessary to consider the effects of baking temperatures and the time of baking on the properties of cores. During the investigation of this subject test specimens were prepared from definite core-sand mixtures, and were tested after baking under controlled conditions. The results of these tests are recorded on the chart in Fig. 1. Transverse test cores one by one by eight inches were made by the standard method from a mixture containing 60- to 70-mesh silica sand, raw linseed oil to the amount of 2 per cent. of the volume of the sand, and water to the amount of 4 per cent. of the volume of the sand. All of the cores were baked in an oven which provided for the introduction of some fresh air, and for the removal of some contaminated air. In every test, the oven was heated to the specified temperature before the test specimens were put into it. The length of time required for the oven to reach the desired temperature after the cores were put into the oven was about 30 minutes. The experimental data indicate that the maximum strength of cores which contain a fixed amount of oil binder is dependent on the baking temperatures. It appears that some of the bonding material in oil-sand cores is destroyed at the higher temperatures. Also, the higher the temperature at which the cores are baked, the more limited is the time interval over which high properties can be obtained. As a rule, modern foundry practice demands that cores be baked in the shortest possible time consistent with high strength. From the test results given in Fig. 1, it is apparent that close control of the conditions of core baking is essential to the economic use of linseed oil as a core binder. The information given in Fig. 1 indicates that the most satisfactory periods for baking oil-sand cores one inch by one inch in section are 40 minutes at 260 deg. C. (500 deg. Fah.), 60 minutes at 230 deg. C. (450 deg. Fah.), 90 minutes at 218 deg. C. (425 deg. Fah.), 150 minutes at 205 deg. C. (400 deg. Fah.), and 7 hours at 180 deg. C. (350 deg. Fah.).

Core-baking costs may be decreased by using every possible means to facilitate the removal of moisture from the interior of cores, and also to facilitate the reaction of linseed oil with oxygen, which reaction is essential to the hardening of the oil films. The use of perforated core plates will aid in the removal of gases from cores of large size. In some cases it may be possible to hollow out the interiors of large cores, thus leaving relatively thin sections of sand in those portions of the core which come in contact with the molten metal.

Summary of Results.

The results of this study of the baking practice for oil-sand cores are summarised in the following statements:—

(1) Oil-sand cores may be placed directly in core ovens which are maintained at maximum baking temperatures, without injuring the cores. (2) The total baking time for oil-sand cores may be decreased by using a minimum amount of moisture or volatile oils in the core-sand mixtures. (3) The presence of oxygen is essential to the hardening of oil-sand cores. (4) The length of time at which oil-sand cores are kept at maximum baking temperatures has a critical effect on the strength of the cores. (5) The higher the temperature at which oil-sand cores are baked, the more limited is the range of time over which high strengths can be obtained in the cores. (6) The removal of the gaseous products which are given off during the oxidation of linseed oil is essential to the rapid and complete hardening of the cores.

The information contained in this report was obtained during an investigation of core-baking practice, which is being conducted at the University of Michigan for the Committee on Industrial Gas Research of the American Gas Association.

The Minister of Transport announces that the Government has had under consideration the advisability of obtaining a report on the problem of the electrification of the main-line railway systems of Great Britain. A committee has accordingly been appointed, consisting of Lord Weir of Eastwood (chairman), Sir Ralph Wedgwood and Sir William McLintock.

* A Paper read before the Chicago Meeting of the American Foundrymen's Association. The Author is Associate Professor of Metallurgical Engineering, University of Michigan.

The New Foundry of Morris Motors, Limited.

INCORPORATES CONTINUOUS PRODUCTION METHODS.

Historical.

It is rather less than ten years ago since the first automobile cylinder was cast in the Cowley-Oxford Foundry of Messrs. Morris (1926), Limited. The demand for Morris automobiles has, however, exceeded all expectations, so that despite the generous provision which had been made in the initial foundry, its capabilities were soon taxed to their limits; extensions thus became imperative to cope with the ever-increasing demands.

In the meantime foundry practice has not stood still, and the management very wisely determined to lay down an entirely new foundry, in which full advantage could be taken of the experience gained with the initial lay-out and where the most modern methods could be adopted in their entirety.

Coventry was selected as the site for the new foundry because of its proximity to the engine works, being distant from these last about two miles and approximately three miles from the centre of Coventry. Future necessities had also to be borne in mind, the Company were therefore fortunate in their acquisition of some 40 acres of land, approached by a good road and conveniently near their works and the city, and which relieves them from all anxiety regarding the possibilities of further extensions. The present lay-out provides for such extensions being made from time to time, as required, by the erection of additional bays without in any way interfering with the continuity of the foundry as a whole. To facilitate such extensions one side of the building is of a temporary nature.

The equipment for the lay-out, which is illustrated in Fig. 1, is of British manufacture throughout, whilst the disposition of the plant was designed jointly between the plant and buildings department of Morris Engines and the foundry manager, Mr. A. Smith.

Throughout the whole scheme there is evidence of a real appreciation of labour saving, which has been carried to, but in no instance exceeds, economic limits, there being an entire absence of those so-called labour-saving devices which enables one labourer to be dispensed with, but demands the attention of two fitters.

One of the most serious charges in the foundry is beyond doubt due to the handling of material, for it must be remembered that approximately 100 tons of material has to be handled for every ton of finished castings produced.

It is in the arrangement of the mechanical handling that Mr. Richardson and his staff of the plant and buildings department have excelled themselves. The initial cost of such a comprehensive system is undoubtedly high, but that is a charge against capital, whilst costs of handling are a charge against revenue, and further, as will be seen from our description, the arrangement provides for an unrestricted floor space.

A description alone might convey the idea of undue complications, but it will be seen from a study of our plan of the general lay-out the complete system is characterised by extreme simplicity.

General.

The new foundry is situate on the Stoney Stanton Road and, as already stated, about three miles from Coventry. It is approached by a gateway entrance, on the side of which is the gate-keeper's and groundsman's quarters, as also the electric sub-station, power being taken from the Corporation mains. From the entrance a broad road of ferro-concrete leads to the offices and works.

The offices are for works administration only, general clerical work, as also testing, etc., being performed at the engine works of the company. It may be interesting to note that the office windows are glazed throughout with sun-ray glass.

The works sidings, which are directly connected to the main line of the L.M.S. Railway, are served by a petrol loco., which is capable of hauling loads up to 60 tons on the flat. The sidings are separated from the foundry by the works road, but as connection between the receiving points of the raw material and the foundry is made by underground tunnels or overhead crane, the road is entirely unobstructed.

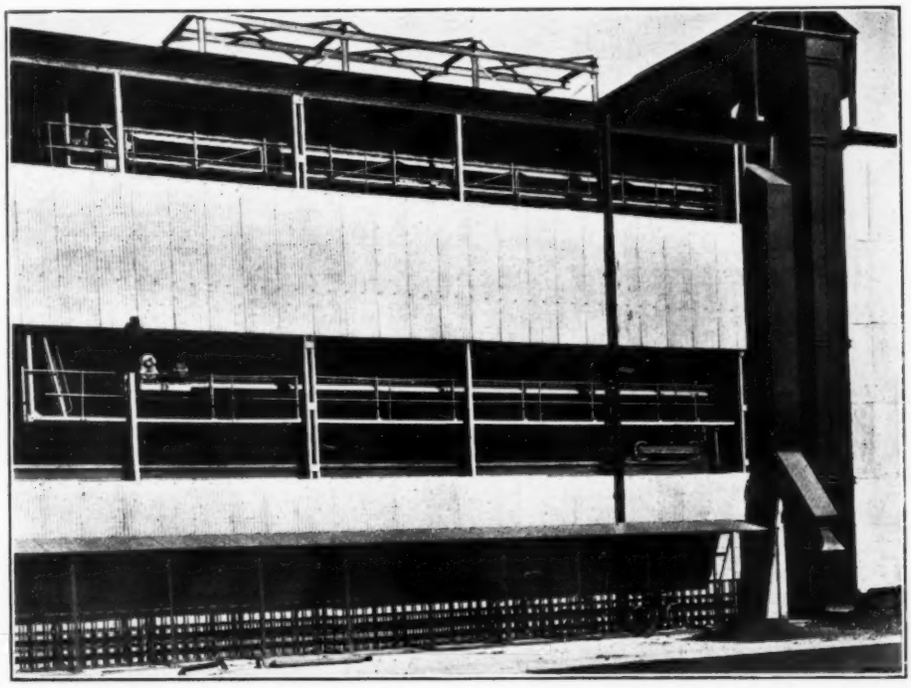


Fig. 3. Morris Conveyor, conveying Coke direct from the Sidings, beneath the Roadway, to Bunkers alongside Cupolas. A General View of the Conveyor over Bunkers, showing the Shaft enclosing the Conveyor leading from the Siding on the Right.

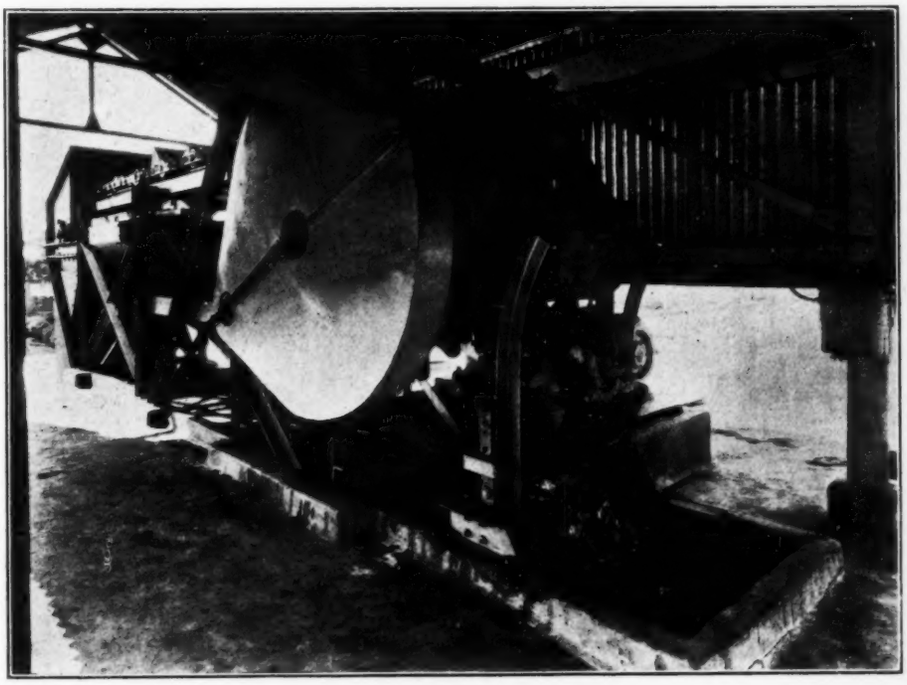


Fig. 4.—A Morris Conveyor, taking the Coke direct from the Siding beneath the Road to the Bunkers on the Cupola Stage. This shows a small section of the Conveyor, illustrated in Fig. 3, where the Shute is shown at the top Right-hand Corner.

The Foundry.

The foundry is covered by seven bays, each 25 ft. wide, built, so far as the permanent portion is concerned, in brick-work, but the end of the building in which direction future extensions will be made is covered with galvanised iron sheeting.

The roofs are provided with ample north lighting, and for the rest are covered with corrugated asbestos sheets. Artificial lighting is by electric lamps placed on the stauncheons, with their rays directed to the working places.

The foundry is heated and ventilated by a system of below-floor ducts, with delivery through works at each stauncheon. In winter the air is drawn through chambers heated by steam coils, and in warm weather the fans circulate fresh air. For this duty there are five fans, three of these are each driven by a 25-h.p. motor and two each driven by a 12-h.p. motor; these fans are capable of changing the whole volume of air in the shop in thirty minutes.

Fig. 2.—The Marshall (Fraser & Chalmers) Coke Wagon Tippler.

As already stated, the receiving points for the raw materials are separated from the foundry by the approach road.

Handling the Pig-Iron.

The pig is brought in by railway wagons to a point opposite the pig-iron stores, beneath an extension of the gantry of the pig-iron-stores crane. This gantry is travelled by a 4-ton crane carrying a 12½-cwt. Witton magnet. Suspended from the crane structure is a cradle of a capacity of 25 cwts. The pig-iron is loaded from the wagons into the cradle, which thus handles 25 cwts. per journey, the arrangement also ensures safety when crossing the works road, as at such times the magnet is carried over the cradle.

Eleven reinforced concrete bunkers, wood-lined and fitted with false fronts, and each of a holding capacity of 25 tons, are provided for storing the various grades of iron, the magnet being employed to discharge the cradle into the various bunkers. The bunkers are arranged in parallel lines, and the magnet also serves to deliver the iron from them to the pig breaker, which is placed in tandem.

The pig breaker is of the improved type, built by George Green & Company, of Keighley. It is driven by a 5-h.p. motor from a cut pinion on the motor spindle, which gears into a machine cut internal spur flywheel. The pigs are broken into four pieces, the maximum output of the machine being from 5 to 6 tons per hour. The broken pig is then conveyed to storage bunkers situated on the platform.

How the Coke is Handled.

The railway wagons bringing the coke are passed through a Fraser & Chalmers tippler (Fig. 2), which is a side discharge type of a

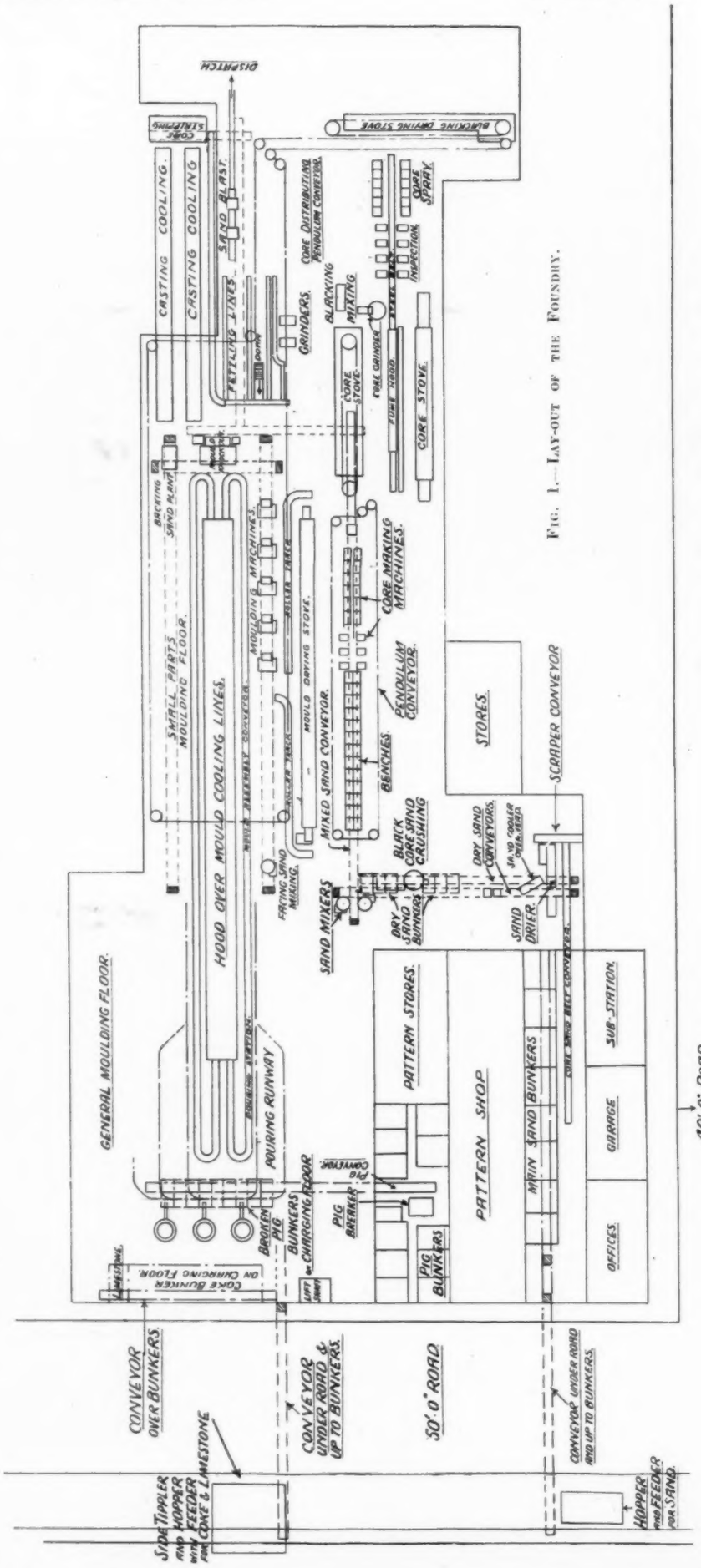


Fig. 1.—Lay-out of the Foundry.

standard "Marshall" design. This design gives a horizontal and forward motion to the discharging edge of the wagon during the period the wagon is being discharged. This motion reduces the fall and the breakage of the coke. The contents of the wagons are discharged into a receiving hopper, the bottom of which is fitted with a long shaking feeder. To keep down the quantity of coke on the feeder the tippler is arranged with a slow speed discharge, so that the coke is slowly poured into the hopper. The tippler takes 1.2 minutes to arrive to the tipping position, the time of discharging varying from 3.6 minutes to 20 minutes, according to the setting of the actual control, and 2.9 minutes to return to the normal position. The variation in speed is obtained by two motors, 10 and 15 h.p., each coupled to the worm of the speed reducing gear, one motor having a high speed and the other a slow speed of rotation. The high speed motor gives the power for the first portion of the wind, the slow speed motor taking charge on the tipping portion of the wind. The slow speed motor can be electrically varied in speed to give the tipping time previously stated; on the completion of the tip, the high speed motor automatically takes control in the reverse direction, and brings the wagon back to the normal position. The electrical control is by push button, and the change over of motors is entirely automatic, being operated by a system of limit switches.

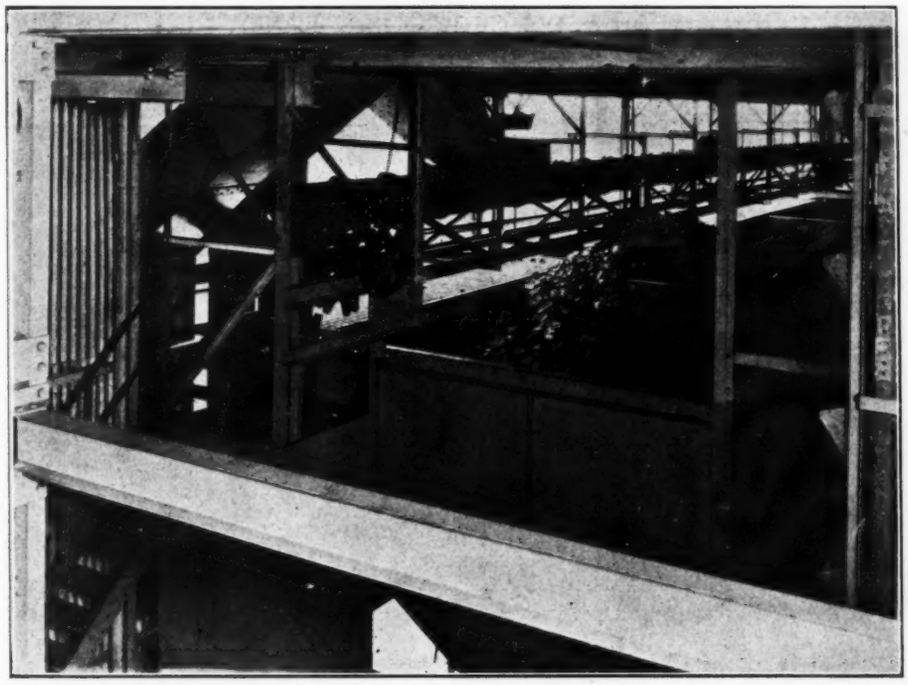


Fig. 5.—Morris Conveyor, conveying Coke direct from Rail Siding, beneath the Roadway, to Bunkers alongside Cupolas. A View showing the Bunkers and the Shute leading from the Conveyor, shown in Fig. 3.

The action is such that the coke is delivered gently on to a sloping wooden bench, with a minimum of breakage, through a shaker feed into a pivoted bucket conveyor, which travels through a brick tunnel beneath the road and then rises to deliver down a shute feeding on to a shute which, fitted with screen bars and given an eccentric motion, takes out all below 3 in., delivering the oversize into a bucket conveyor, which is fitted with a travelling tripper, and discharges into the coke bunker of 50 tons capacity.

Limestone is handled by the same conveying system, the screen bars in this case being covered by steel plates, which are hinged on to the shutes. The limestone bunker of 20 tons capacity is placed tandem with the coke bunker.

The conveying system, shown in Figs. 3 and 4, was supplied by Herbert Morris, Limited, of Loughborough. The conveyor delivering to the screen is driven by a 7½-h.p. motor and the bucket elevator by a 3½-h.p. motor. Its details are well illustrated in Figs. 3 to 5.

When handling coke the system is equal to a duty of 10 tons per hour, and approximately 30 tons per hour when dealing with limestone.

Fig. 6.—Morris Conveyor, conveying Sand direct from Railway Siding, beneath the Roadway, and to the Storage Bunkers. A View of the Platform alongside Bunkers; the Man is Setting Bucket-Discharging Device.

Preliminary Sand Handling.

Leighton Buzzard sand is employed exclusively for cores, whilst a Bromsgrove sand is used for moulding. The sand is delivered in railway wagons and is shovelled on to a shaker feeder which feeds a similar conveyor to that for the handling of coke and limestone, and which was built by Morris, of Loughborough. This conveyor, illustrated in Figs. 6 to 9, delivers to a battery of eight sand hoppers, each of 100 tons capacity, shown in Fig. 1.

The Melting Plant.

This consists, for the present, of three Pneulec cupolas, 5 ft. in dia. by 37 ft. 9 in. in height to the underside of the spark arresters. They are shown in Figs. 10 to 12. They are provided with a special arrangement of drop bottoms, this feature being designed in its entirety by the plant and buildings department connected with the Company's engine factory.

The cupolas are carried on a steel structure supported upon substantial concrete columns, thus forming a pit beneath the bottoms; this pit is laid with a track and travelled by a heavy iron bogie into which the cupolas are emptied, the arrangement being such that the bottoms cannot be dropped unless and until the bogie is in position. The doors are forced into position by pneumatic cylinders, to open them the air is exhausted and the column knocked out of dead centre by a sharp blow of a hammer on a plunger which is placed on the furnace fettling and tapping platform. The bogie is lifted from the pit by a 5-ton crane (shown in Fig. 11) and transferred to outside the building, where the coke is sorted out from the slag.

The charging floor (Fig. 12) is of very generous proportions, being 75 ft. long by 40 ft. wide, and it provides space for the installation of two further cupolas. The platform is served by an overhead runway, from which the 10-cwt. charging hopper is suspended with a Salter balance interposed. A platform of practically the same size surrounds the spark arresters, so that these are more than usually accessible for cleaning and attention.

The blowing plant consists of two Sirocco fans,

XUM

Sand Conveyors and Melting Plant at the New

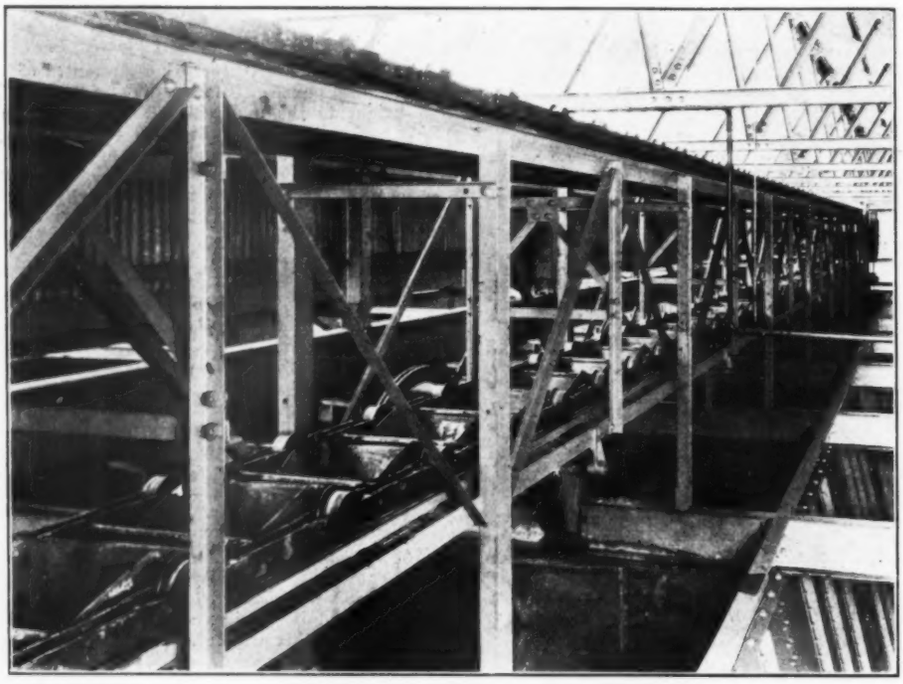


Fig. 7.—A Morris Conveyor, carrying Sand direct from the Sidings beneath the Roadway, to the Storage Bunkers. A View from the Bunker Side of the Conveyor.

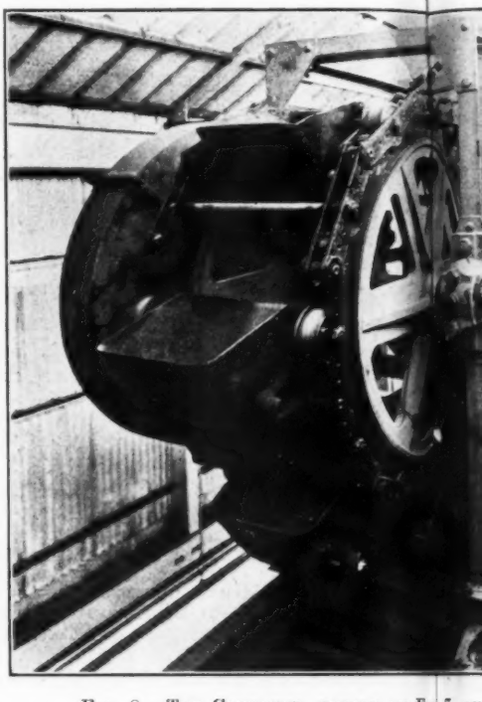


Fig. 8.—The Conveyor, shown in Fig. 7, bu

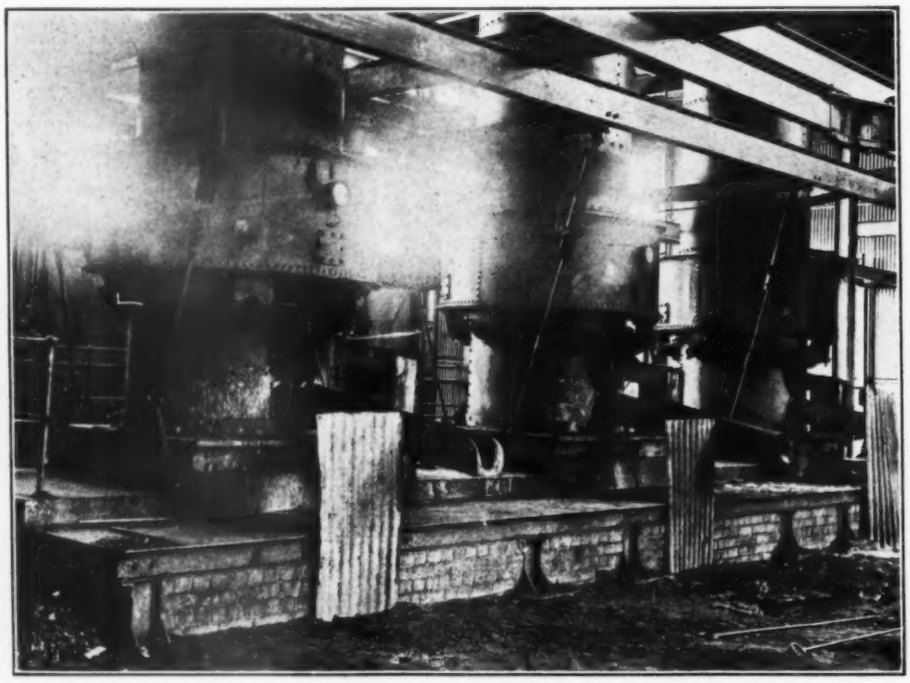


Fig. 10.—The Tapping Side of the Pneulec Cupolas installed in the Foundry of Morris Motors, Limited.

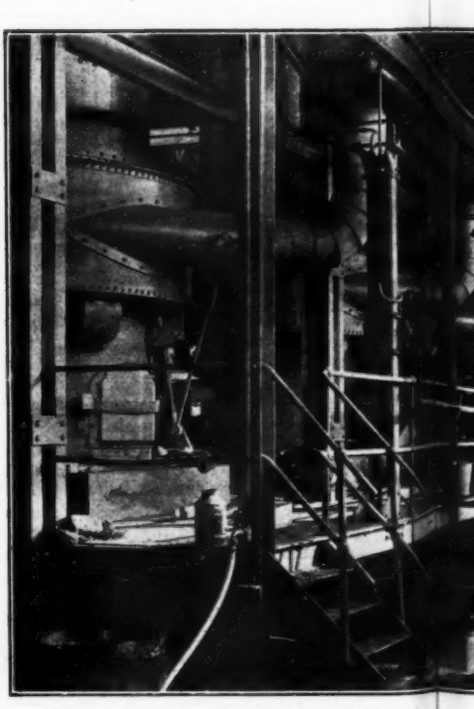
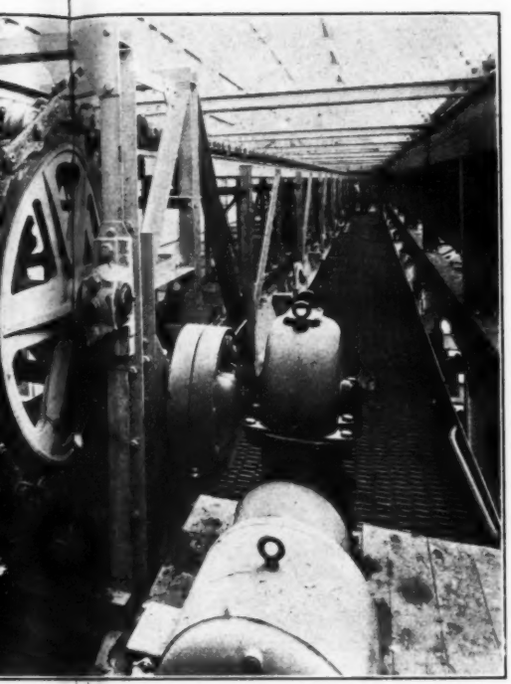


Fig. 11.—Rear View of Pneulec Cupola. Operated.

the New Foundry of Morris Motors, Limited.



WN IN FIG. 7, BUT TAKEN FROM THE DRIVING SIDE.

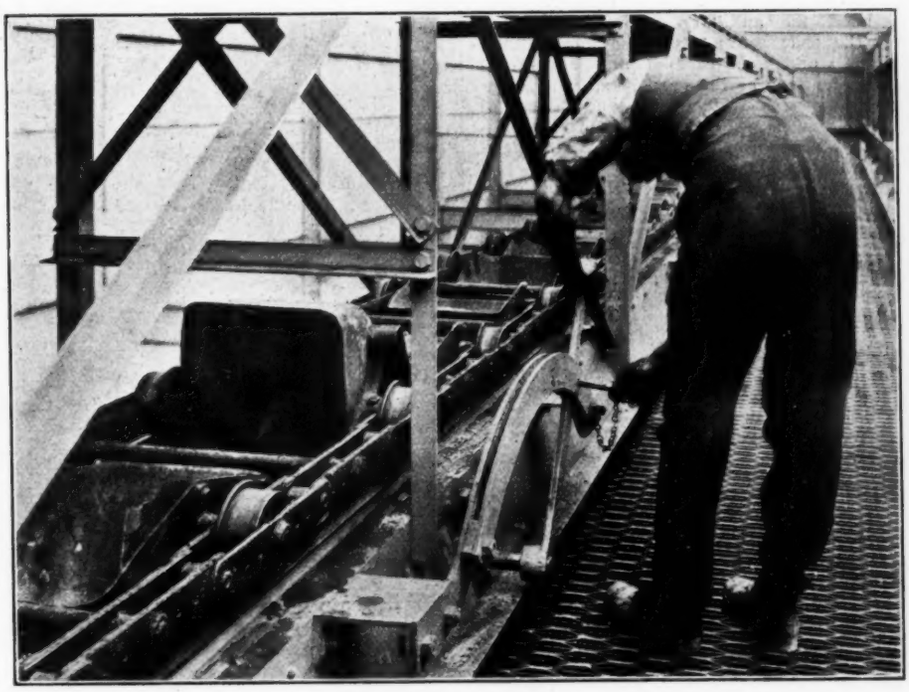
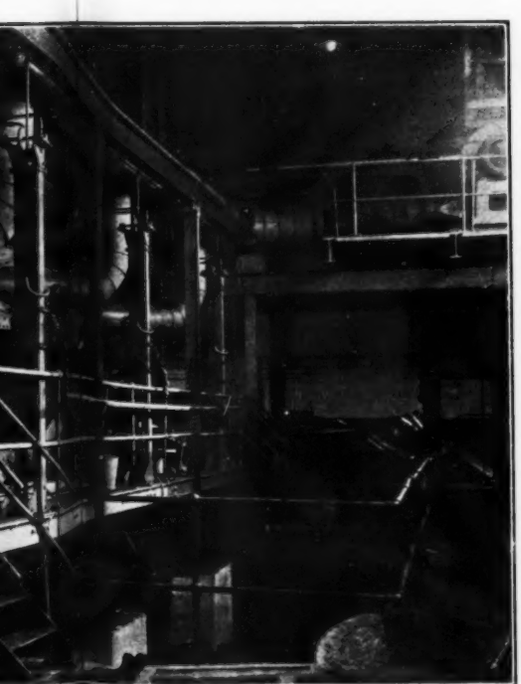


FIG. 9.—THE CONVEYOR, SHOWN IN FIG. 7, BUT DETAILING THE BUCKET-DISCHARGING DEVICES.



LEC CUPOLA. THE BOTTOM DOORS ARE PNEUMATICALLY OPERATED.

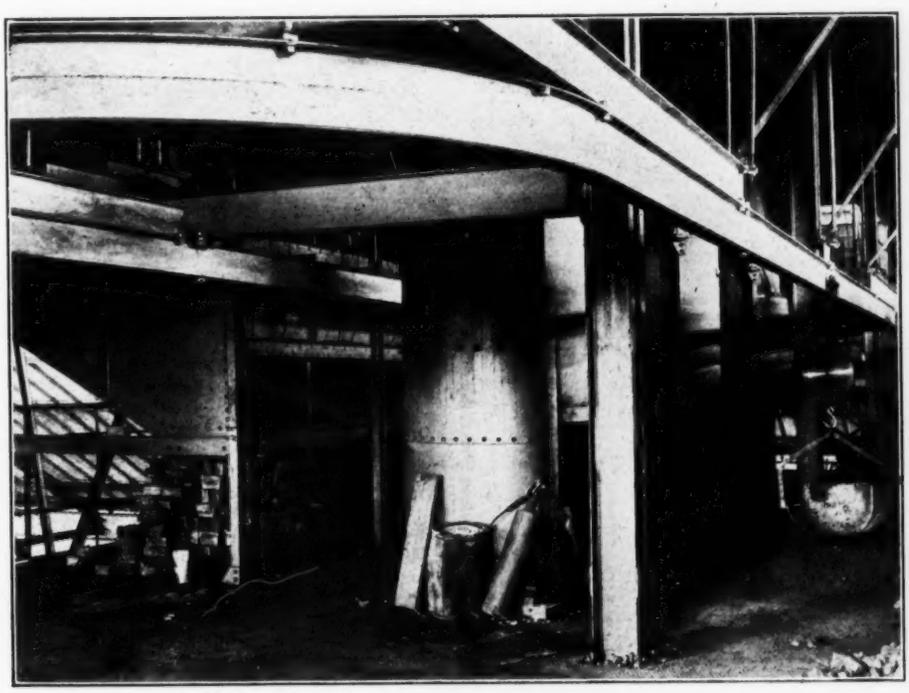


FIG. 12.—CUPOLA CHARGING PLATFORM, SHOWING THE STORAGE BUNKERS AND CHARGING SKIP.

XUM

each driven by a 45-h.p. motor and supplying blast at 20-in. w.g.; either unit is equal to the duty of two cupolas.

As will be seen from our illustration, the platform storage bunkers are situated waist high for the easy transfer of pig and coke (Fig. 12) into the monorail-carried tipping charging bucket.

As will be understood from the foregoing, raw materials are delivered to the charging platform by the conveying system; there is, however, an electric hoist for auxiliary duties, such as handling the shop scrap, etc.; the hoist also furnishes a standby in case of an untoward breakdown of either of the conveyors.

The metal is teemed in 5-cwt. and 10-cwt. ladles, of James Evans & Collin manufacture. All casting is done from a monorail fitted with an electric manual hoist.

It will be noted that throughout the whole of the foundry there is a very complete system of overhead runways, which have been supplied by Herbert Morris, Limited, of Loughborough. It is at once obvious that the reduction in heavy manual labour incidental to the installation of the runways has a very material effect on the efficiency of the foundry as a whole.

It may be noted that the whole of the internal conveying systems to be hereafter referred to was designed and built by Herbert Morris, Bagshawe & Company, New Conveyor Company, and the Steel Band Conveyor Company, who carried out the work in close collaboration with Mr. Smith and the works engineering staff.

How the Core Sand is Treated.

In the methods of production employed in the foundry the very extensive use of cores is a marked feature, and the well-designed sand mixing and handling lay-out calls for special mention. It was largely carried out by Messrs. Bagshawe & Company.

Sand for the production of cores is taken from the storage bunker by a rubber belt conveyor, which delivers on to a Bagshawe scraper conveyor (shown in Fig. 13), which runs at right angles and delivers to a coke-fired rotary sand dryer, by August's Muffle Furnaces, Limited; the dryer fan is driven by a 1-h.p. motor. The belt and the scraper conveyor are driven from one motor of 4 h.p., and the output of the dryer is approximately 5 tons per hour. The sand from the drying chamber passes over a screen, which is an integral portion of the dryer. The through material from the screen is raised by a bucket conveyor elevator (shown in Fig. 14) and discharged into a cooler of the combined air and water type.

(To be continued.)

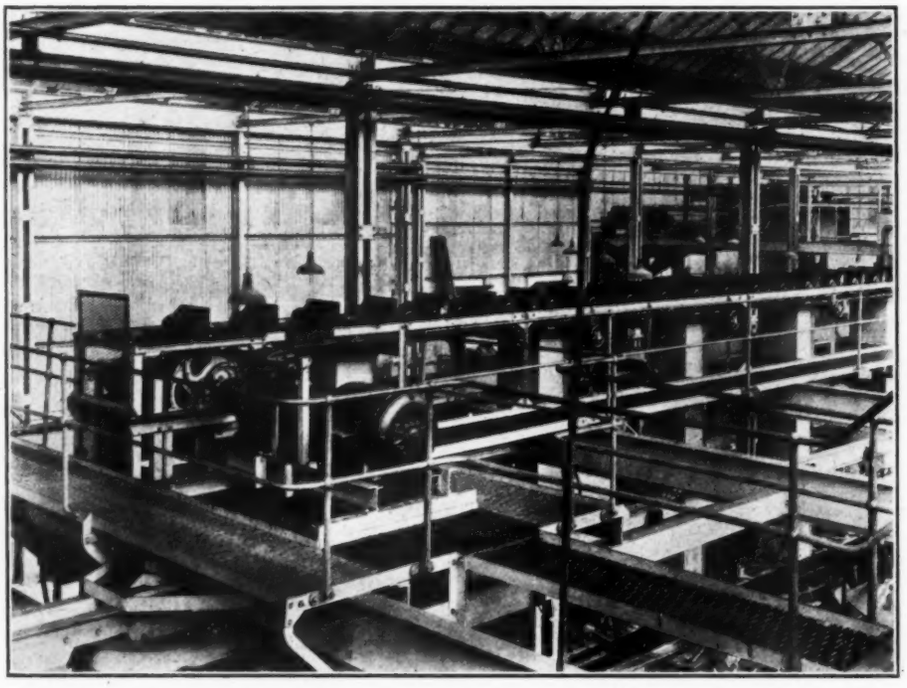


Fig. 13.—Bagshawe Scraper Flight Conveyor, serving the Core Department.

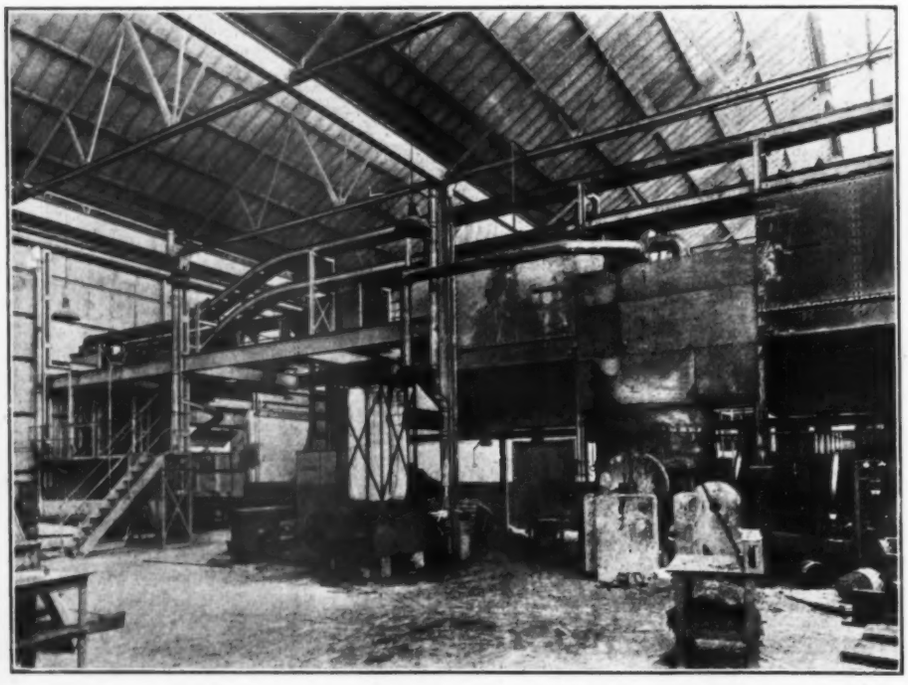


Fig. 14.—Bagshawe Pivoted Bucket Conveyor, dealing with the Core Sand.

The partnership between Messrs. R. M. Roberts and M. Butterworth, carrying on business as brass and ironfounders, under the style of Richard Roberts & Sons, at 24, Slater Street, Liverpool, has been dissolved. Mr. M. Butterworth is continuing the business.

The Importance of the Rhenish-Westphalian Foundry Industry.*

By Oberingenieur Langenohl (Gelsenkirchen).

[*Extract.*]

The author dealt with the importance of the foundry industry in connection with the general industrial conditions in Rhenish-Westphalia, and questions affecting these relations. After a brief historical sketch of the development of the foundry trade in the region concerned, the author gave figures showing the quantities and values of cast products in this region as compared with the figures for the whole of Germany and in relation to other branches of the iron industry in Rhenish-Westphalia. He then fully dealt with the economic position of the foundries. He also discussed the effects of the occupation of the Ruhr on the foundry trade, and touched on such matters as numbers of men engaged in industry, prices and estimating, the supply of raw materials, costs of production, markets, Customs policy, export, etc. Finally, the author referred to the close relationship between the heavy and light industries. It was stated, in this connection, that in addition to the heavy industry, there are quite a number of independent foundries that have been able to "make good" for generations, in good times and bad. The main aim of concentrated effort in the iron industry was to cut costs as low as possible by rationalised methods, and, by co-operation, to increase the field and provide the huge capital sums necessary in order that the foundry industry, and industry as a whole, could regain its lost position in the home, but particularly in the foreign, markets. German industry as a whole can only be fully resuscitated by co-operation among all branches of industry.

Messrs. Geo. G. Blackwell, Sons & Company, Limited, The Albany, Liverpool, announce that their head office will be removed as from October 1 to Speke Road Works, Garston, Liverpool. The head office of Blackwell's Metallurgical Works, Limited, will be removed to the same address.

* A Paper presented at the 59th Annual General Meeting of the German Union of Iron Foundries (Technical Foundry Association), held at Düsseldorf from September 4-7.

The Basic-Bessemer Process of Steelmaking.

COMMEMORATION OF EPOCH-MAKING EVENT.

This year is the Fiftieth Anniversary of the successful completion of the series of experiments by Sidney Gilchrist Thomas and Percy Carlyle Gilchrist, of Messrs. Bolckow, Vaughan & Company, Limited, in connection with their investigations into the basic process of steelmaking. In commemoration of this epoch-making event, Messrs. Bolckow, Vaughan have compiled a very tastefully-bound little volume setting out the principal facts, and from these we have made the following extracts:—

No names occupy more honoured places than those of Sidney Gilchrist Thomas and Percy Carlyle Gilchrist, to whose joint efforts we owe the basic process of steelmaking. It was at the Cleveland Steelworks of Messrs. Bolckow, Vaughan & Company, Limited, at South Bank, near Middlesbrough, that the process received a trial and that its success was established in April, 1879. Both inventors were men of outstanding personality, and the death of Thomas, at the early age of 35, robbed the world of a remarkable man and the steel industry of an able research worker whose contributions to the science of metallurgy occupy a permanent place.

Sidney Gilchrist Thomas was born in 1850, and received his education at Dulwich. At the age of 17 he was preparing for matriculation at London University to study the profession of medicine. Owing to his father's sudden death, Thomas was compelled to abandon the career he had mapped out for himself and to seek some means of supplementing his mother's income. For a time he took a classical mastership at a school in Essex, and retained it till he was appointed to a junior clerkship in the Metropolitan Police Courts at a salary of £90 per annum. For some 12 years he retained this position, devoting all his spare time to the study of science, principally chemistry.

In 1870 he attended a course of lectures at the Birkbeck Institute. At one of these lectures Mr. George Challoner, the lecturer, said: "The man who eliminates phosphorus by means of the Bessemer converter will make his fortune." This remark seemed to have fired Thomas' imagination and remained always prominent in his mind. From that time on he became a constant reader of all the literature on the subject. In 1872 he took a first class in the advanced course in mineralogy at the School of Mines, and the following year a first class in the advanced course in inorganic chemistry. In 1875 the problem of eliminating phosphorus was maturing in his mind, and in 1876 he enlisted the help of his cousin, Percy Carlyle Gilchrist, who was then chemist at a works in South Wales. Together they endeavoured to bring to a solution the then unconquered problem of dephosphorisation by the Bessemer process. They were both obliged to work at the greatest disadvantages, neither having means or time. Thomas, always frugal and thrifty, had managed, during his 12 years' service as a clerk, to save £800. This money enabled them to embody the result of their combined work in two patents, No. 4,422 of 1877 and No. 289 of 1878.

Possibilities of Process Demonstrated.

The work of these two inventors demonstrated the possibilities of their process, but they then entered upon a period of difficulty and shortage of money. Assistance was forthcoming, however, from Mr. Martin, the general manager of the Blaenavon Steel Company in South Wales. On March 6, 1878, another patent, No. 908, was taken out. The inventors made such progress that at the autumn meeting of the Iron and Steel Institute, held in Paris in 1878, Mr. Thomas presented a Paper entitled "On the Elimination of Phosphorus in the Bessemer Converter." It was neither read nor discussed, but adjourned until the meeting in 1879, when it was read by Mr. Thomas and published in the "Journal."

There were, however, members who had obtained an early copy, and among them was Mr. E. Windsor Richards (manager of Bolckow, Vaughan & Company, Limited). During this meeting of the Iron and Steel Institute an excursion was made to the Creuzot Works in France; Mr. Windsor Richards made the acquaintance of Mr. Thomas, and he was so impressed by the importance of the discovery and the personality of the inventor that he determined there and then to urge his directors to give the process a trial. Their consent was at once forthcoming.

Mr. Windsor Richards and Dr. J. E. Stead, F.R.S., then consultant to the Company, undertook, with Thomas and Gilchrist, the practical development of the invention. Working on a manufacturing scale revealed unforeseen troubles and difficulties, and too much credit cannot be given to Mr. Windsor Richards and Dr. Stead for the courage and skill with which these problems were met and solved.

One problem in particular occupied their skill and patience. The chemical constitution of the converter lining was well known, but there remained the problem of preparing the material for the lining in a form which would remain stable throughout the process, and the physical problem of ensuring the adhesion of the lining to the converter walls. Dr. J. E. Stead, in his Presidential address to the Iron and Steel Institute in 1920, has well described these difficulties and their solution.

The practical demonstration of the new basic process took place before a gathering which included the late Sir Joseph Pease at the works of Bolckow, Vaughan & Company, Limited, on April 4, 1879. On this occasion a 30-cwt. Bessemer converter was used.

May 3, 1879.

Metal samples.	Silicon.	Graphite	Combined carbon.	Phosphorus.	Time. Min.	sec.
Pig-iron	2.89	3.36	0.06	1.52	—	—
1	2.21	2.64	0.80	1.51	3	0
2	1.43	0.06	2.55	1.51	6	0
3	0.78	Trace	2.50	—	9	0
4		Bad sample				
5	0.13	Nil	0.53	1.36	12	0
6	0.10	Nil	Nil	1.01	15	0
7	Trace	Nil	Nil	0.77	17	30
8	Nil	Nil	Nil	0.41	18	30
9	Nil	Nil	Nil	0.12	19	30
10	Nil	Nil	Nil	0.10	20	30
Steel	Nil	Nil	Nil	0.18 Mn0.15	21	10

It was generally recognised that Dr. Stead's suggestion of overblowing the charge was fundamentally necessary to the Thomas and Gilchrist process. The presence of high silicon in Cleveland pig-iron was a further difficulty. To overcome this a method known as the "transfer" system was evolved. This consisted of desiliconising the pig-iron in an ordinary acid converter and transferring the desiliconised iron to a basic-lined converter where the phosphorus was eliminated. This method, however, was abandoned owing to expense and the practical difficulties in operating two separate converters.

Ultimately, on April 4, 1879, using one of the two experimental 30-cwt. converters which had been erected for the purpose, steel was produced by Bolckow, Vaughan & Company, Limited, under the supervision of Messrs. Gilchrist and Thomas, from Cleveland grey pig-iron. The first record which the Company possesses on the subject deals with a "blow" on May 3, 1879. The record reads:—

This table shows how the elimination of the phosphorus proceeded during the "blow." Various modifications have since taken place which have rendered this elimination more complete. In connection with the foregoing table, it is interesting to note that it was compiled by Mr. J. R. Skinner, who only retired from the Company's service three years ago. He watched the development of the basic process from its inception through the period of its use by Bolckow, Vaughan & Company, Limited.

Basic Open-Hearth *v.* Basic-Bessemer Steel.

The discoveries of Thomas and Gilchrist and their subsequent development by Bolckow, Vaughan & Company, Limited, opened the way to the manufacture of reasonably reliable basic-Bessemer steel, low in phosphorus and free from brittleness. The basic-Bessemer process is in its nature drastic, demanding at the end of the "blow" highly-oxidising conditions for the removal of the phosphorus.

Cleveland pig-iron, with its average phosphorus content of 1.6 per cent. compared with the 1.8 per cent. to 3.0 per cent. in ordinary basic pig-iron, lent itself readily to basic-Bessemer working. The "after-blow" necessary to eliminate the phosphorus was shortened, and the bath of metal in the converter could be kept for a proportionately shorter time at the highest temperature.

The purification process takes the very short time of 20 to 30 min., mostly occupied in eliminating the silicon, carbon and manganese of the pig-iron. The phosphorus removal mainly occurs during the last few minutes of the process—during the "after-blow." The furnace-man gauges the elimination of these elements by eye and with the aid of a spectroscope. There is no time to take check tests, and the quality of steel is entirely dependent on the skill and attention of the furnace-man.

Recognising the objections to the basic-Bessemer process—which may be summed up briefly as lack of control—Bolckow, Vaughan & Company, Limited, determined, in 1911, to give up the basic-Bessemer and acid-Bessemer steel processes in favour of the Siemens-Martin open-hearth basic process, now exclusively employed at the Cleveland Steelworks.

Reports and Dividends.

Vulcan Foundry, Limited.—Dividend on the ordinary shares of 10 per cent.

Coltness Iron Company, Limited.—Interim dividend of 4 per cent., less tax.

Ibbotson Brothers & Company, Limited.—Profit, £8,427; final dividend of 6s. per share, making 7½ per cent. for the year.

Dalmellington Iron Company, Limited.—Net profit, £26,998; brought in, £11,109; final dividend of 1s. per share on the ordinary shares, tax free, making 7½ per cent. for the year; carried forward, £11,133.

Staveley Coal and Iron Company, Limited.—Net profit, £306,118; brought in, £114,313; final dividend of 2½ per cent., tax free, making 5 per cent. for the year; to general reserve, £100,000; additions and renewals, £40,000; carried forward, £111,162. As a result of a detailed valuation of the collieries, ironworks and other properties during the past year, these items are now shown in the balance-sheet at £3,584,622, as against £3,846,258 at June 30, 1928. To meet the difference the directors have transferred £392,591 from the depreciation reserve, leaving that account at £572,409.

ACCORDING TO Mr. Edwin F. Core, writing in the "Iron Age," the principal features of the last 20 years' progress in alloy steels were:—(1) In 1928 only 16 tons of total steel to 1 ton of alloy; in 1909 this ratio was 131.6 to 1. (2) In 1928 over 3,000,000 tons of alloy steels produced; in 1909 about 182,000 tons. (3) In 1928 electric alloy steel castings made up over 18 per cent. of total electric alloy steel; in 1909 none was reported.

XUM

Lancashire Foundrymen visit Altham Coke Ovens.

By the courtesy of the directors of the Altham Colliery Company (1924), Limited, members of the Lancashire Branch of the Institute of British Foundrymen paid a visit of inspection, on August 24, to the recently-erected coke ovens and by-product works at Moorfield Collieries, Altham.

Nature has been particularly bountiful to this part of Lancashire in providing a coal of such excellent quality and having such good coking properties as the Mountain Mine seams. Away in the 'seventies there were beehive coke ovens in operation crudely making coke and wasting all the other valuable products. Then in 1883 came one of the first batteries of patent ovens, from which some of the gaseous products were recovered, and now there has been installed one of the most modern and complete coking plants in existence, from which is separated every useful commodity which science can extract from coal.

The visitors, some 47 in number, were accompanied by the President of the Branch, Mr. J. Longden, and by the hon. secretary, Mr. H. Stead. They were most cordially welcomed by Mr. George Barlow, a director of the Altham Colliery Company, with whom was Mr. D. V. Hollingworth, F.I.C., M.I.Chem.E., the manager of the coke ovens, and several other members of the commercial and technical staff.

A Group of Members of the Lancashire Section of the Institute of British Foundrymen, taken in the Works of the Altham Colliery Company (1924), Limited.

The first process in the preparation of a high-class foundry coke consists in the removal of impurities from the slack to be employed. The method employed at Altham is known as the Birtley dry-cleaning process, and consists in passing the slack over many sloping tables having rifled surfaces. These tables are in constant agitation, and are so arranged that air may be blown through the particles of slack. The combined effect of the vibration—the air current and the differences in the specific gravity between the good coal and the impurities—results in a large portion of the latter being removed. The visitors made a close inspection of this plant, and quickly noticed the benefits of the dry-cleaning method over the more usual one where water is used to wash away the impurities.

The party next proceeded to the coke ovens, where Mr. Barlow addressed a few remarks to the members of the Institute. He emphasised particularly that the Altham Company were glad to take the opportunity of showing their new ovens and plant to such a highly technical group. The days of secret processes and sealed-up works were happily over, and they at Altham were more than willing to show visitors all their processes, and to give them all the help in their power. Mr. Barlow then asked Mr. Hollingworth to describe the plant they had come to see. Before proceeding to describe the special details of construction of the ovens, Mr. Hollingworth referred to the great difference in results obtained by burning coal in open grates as compared with heating (carbonising) it in closed chambers like coke ovens. In the former case the coal substances were immediately converted into coke and incombustible gases, whereas in the other case it was separated into coke, coal tar, ammonia, benzole and illuminating gas. He then outlined the construction of the various types of ovens that had been employed for carbonising, and showed that the ovens at Altham were designed to give the largest-sized coke possible, and to recover the maximum of products with the minimum consumption of fuel gas. This had been so successfully accomplished that it had been possible to supply the whole of the Accrington district with gas from the plant.

The new coke-oven installation consists of 18 ovens, erected by Messrs. Coke and Gas Ovens, Limited, London, having a producing capacity of 1,200 tons of coke per week. Each oven takes a charge of 14 tons of coal, and this quantity is carbonised in about 22 hours. An electrically-driven machine fills the oven with slack, and another levels the charge when it is in the oven. When carbonisation is completed, the doors of the oven are picked up by a further machine, and the red-hot coke is pushed clean out of the oven by a great ram. The coke is caused to fall into a large tank filled with water, situated at the other end of the oven. This tank is attached to a machine which elevates the quenched coke out of the tank, permits it to dry, and then propels it on to a sloping bench. On this bench the foundry coke is submitted to a very close inspection, every faulty piece of coke being picked out of the batch before it is loaded up into trucks. All the operations described were witnessed by the visitors, and the method of heating the ovens and the temperatures attained were shown to them. The course of the gases was explained, how they were first cooled in condensers with cold water, then scrubbed, first with water by which ammonia was removed, and then by creosote oil by which benzole was extracted.

Perhaps one of the most interesting parts of the inspection was the machinery in the exhauster house. Here there were rotary exhausters for drawing the gas from the ovens and forcing it through the scrubbers and thence to the gas-holders. Compressors for forcing the gas through the mile-long main to the gasworks, and the measuring and pressure-recording instruments. The benzol refinery next claimed attention; this plant separates the benzole from the creosote oil-benzole mixture obtained in the scrubbers. The crude benzole is re-distilled with steam, the fractions washed with sulphuric acid, water and caustic soda, and again re-distilled, the result of this treatment being that a pure benzole suitable for motor spirit, and for the manufacture of dyes, medicines, etc., is obtained.

As considerable extensions to the plant were in progress at the time of the visit, the party had an opportunity of seeing these also. The present plant is being extended threefold; thirty-six additional ovens are being erected, with all the ancillary plant, comprising scrubbers, exhausters, gas-holders, etc., and on an adjacent site a large tar distillery and ammonia factory is being erected. When all this plant and apparatus is in full productive work, the Company will possess one of the best-equipped works in the country.

At the conclusion of the tour of the works the visitors were photographed. Tea followed, and afterwards the thanks of the members of the Institute were conveyed to the directors and staff of the Altham Colliery Company by Mr. Longden, who said that the extent of the works they had that day seen was a revelation to all of them. He said that firms who showed such enterprise and were willing to risk such an enormous amount of capital, as the Altham Company had done, deserved to succeed, and he sincerely hoped they would do so. Mr. Flower, in seconding, referred to the complicated nature of the processes associated with the manufacture of coke, and remarked that a good deal had been learned that day which would be useful to many of them. It was a matter of great satisfaction to him to know that a Lancashire firm had so huge and perfect a plant.

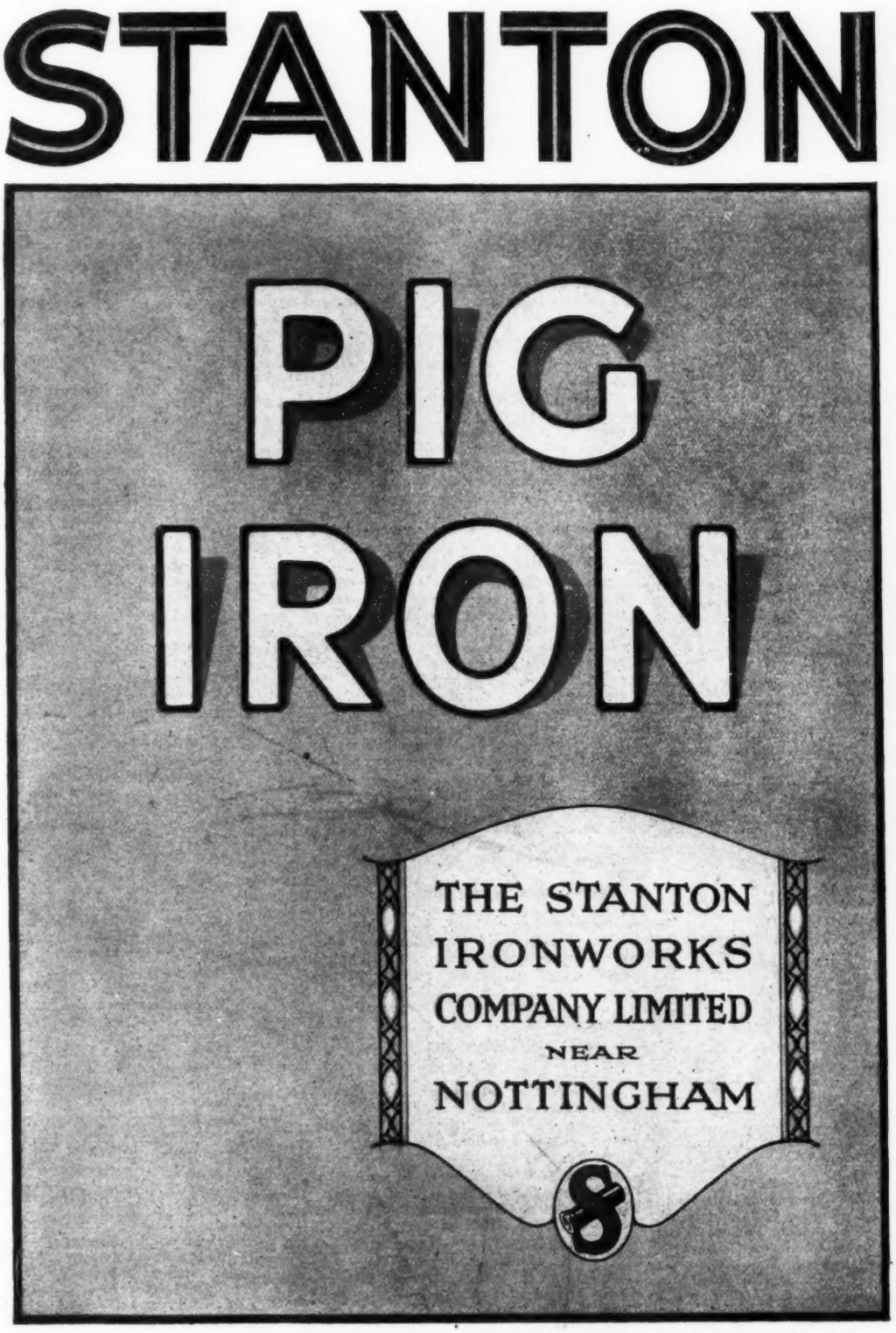
Mr. Hollingworth, in the absence of Mr. Barlow, who had to leave early, replied on behalf of the directors, and said that, when the possibility of a visit was first mentioned, the Company were most anxious that it should take place. He hoped that what they, as expert foundrymen, had that day seen would do something to remove the prejudice against patent-oven coke which appeared to exist in some parts of Lancashire even to-day.

National Industrial Safety Congress in Sheffield.

The National "Safety First" Association (Inc.) are this year holding their Annual Industrial Safety Congress in Sheffield. The Congress will be held at the Cutlers' Hall, and delegates will be welcomed by the Rt. Hon. the Lord Mayor of Sheffield, an opening address being given by Mr. Alfred Short, M.P. (Parliamentary Secretary to the Home Office). The chairman of the Congress is Sir Gerald Bellhouse, C.B.E. (H.M. Chief Inspector of Factories), and all arrangements are in the hands of the Sheffield Local Area Committee of the National Association. Amongst the Papers to be submitted is one by Mr. F. Woodifield, of the Parkgate Iron & Steel Company, Limited, Rotherham, on "The Organisation of a Local Area Committee."

On October 10 a visit has been arranged for delegates to inspect the works of the Parkgate Iron & Steel Company. Full particulars regarding the Congress can be obtained upon application to The General Secretary, The National "Safety First" Association, Inc., 119, Victoria Street, London, S.W.1.

XUM


STANTON
PIG
IRON
THE STANTON
IRONWORKS
COMPANY LIMITED
NEAR
NOTTINGHAM

Trade Talk.

Messrs. Henry Robb, Limited, Leith, have launched from their Victoria shipyard a steel-screw steam tug, which they have built for service in East Africa.

Messrs. Cammell Laird & Company, of Birkenhead, launched last Thursday the "Kaimiro," the first of two vessels under construction for the Union Steamship Company of New Zealand.

Trials have been completed on the Clyde by the steamer "Goschen," recently built by Messrs. D. & W. Henderson & Company, Limited, Glasgow, for the Southern India Railway Company.

A new oil tanker, "Asperity," 700 tons gross, built by Messrs. G. Brown & Company, Greenock, for Messrs. F. T. Everard & Sons, Limited, London, has completed successful trials on the Clyde.

Krupps have put in a claim for an increase of their quota in the German Steel Ingot Syndicate by 175,000 tons. Under the current agreement, which is to expire on October 31, 1929, the firm's allotment is 1,792,085 metric tons.

Mr. H. F. Haworth and Mr. C. T. Skipper, of Leyland Motors, Limited, are making a tour of inspection of American automobile and machine-tool works with a view to purchasing new equipment for the modernisation of the Leyland works.

A fire occurred in the shipbuilding yard of Messrs. Napier & Miller, Limited, Old Kilpatrick, Bowling, Glasgow, recently. The fire brigade were successful in confining the outbreak to the joiners' store and the smithy, but considerable damage was caused.

Messrs. Penicud & Company, 3, Rue Victor Hugo, Bagnolet (Seine), France, have appointed the Universal System of Machine Moulding and Machinery Company, Limited, of 13 to 15, Wilson Street, London, E.C.2, as their sole representatives for the British Empire.

The British Representative at Stockholm, Sweden, reports that by a Royal Decree, dated August 15, the prohibition on the exportation of malleable scrap iron (except galvanised or tinned scrap) from Sweden has been prolonged until February 28, 1930.

Messrs. Wilson Bros. (Special Fittings), Limited, ironfounders, of Dalmarnock Road, Glasgow, have acquired the premises previously occupied by the Barrowfield Ironworks, Limited, in Fordneuk Street, Bridgeton, and are erecting a new foundry for the production of pipes and connections.

Subject to grants from the Unemployment Grants Committee, the Tyne Improvement Commission has agreed to accept the tender of Messrs. R. & W. Hawthorn, Leslie & Company, Limited, Hebburn, for a new ferry steamer, amounting to £28,350, and to extend Riverside Quay, North Shields, at a cost of nearly £21,000.

Messrs. Robert Warner (Pumps), Limited, Pottery Lane, Newcastle-upon-Tyne, have acquired the business and goodwill of Messrs. Henry Watson & Sons, Limited, Walker Gate, Newcastle-upon-Tyne. They are removing all the patterns, drawings, etc., to their works at Pottery Lane, where they will continue the manufacture of Watson pumps, evaporators, feed heaters, filters and other marine specialities.

The Mannesmann Tube Company, Germany, which recently acquired a heavy interest in the British Mannesmann Tube Company, Limited, now owns about £1,444,000 of the British company's capital, about 65 per cent. of the stock in the French company, Aciéres et Usines de la Saar, and about 90 per cent. of the stock of the Mannesmann works in Czechoslovakia.

Notices to terminate their engagements have been served on the majority of workpeople at the Cyclops Iron and Steel Works, Sheffield. It is understood that the notices expire at the end of this week and that the works will then be closed down. Between 600 to 700 men will be affected. The works were among those taken over by the English Steel Corporation, Limited, from Messrs. Cammell Laird & Company, Limited.

It is reported that Messrs. Haslam & Newton, Limited, of Derby, have secured an important contract in connection with the equipment of various Italian Government wireless stations. Machinery for the Marconi Company, in connection with another Italian Government contract, is at present being constructed at the Derby works. Messrs. Haslam & Newton, Limited, have recently supplied machinery for the new B.B.C. station near Potters Bar.

The world's first iron railway bridge has been re-erected in the York Railway Museum. The bridge was designed by George Stephenson to carry the Stockton and Darlington Railway over a small river to the West Auckland pits, from which coal was carried for shipment on the Tees. Built in 1825, it was dismantled in 1900 and laid away. The whole framework of the bridge has been erected in the museum, forming an excellent illustration of early railway engineering.

A complaint of delay in the transport of steel by rail was voiced at a meeting of the Tees-side Chamber of Commerce recently. The Furness Shipbuilding Company, Limited, stated that four days were taken for steel to be conveyed from West Hartlepool and Cargo Fleet to Haverton Hill, and on the average the greater delay was noticeable on the deliveries from Cargo Fleet. The Chamber decided to take up the matter with the London and North Eastern Railway Company.

Messrs. Wright, Anderson & Company, Limited, constructional engineers, Gateshead, have secured from the Air Ministry a contract for the erection of an aerodrome at Thornaby-on-Tees. Messrs. Wright, Anderson & Company, who specialise in the design, fabrication and erection of constructional steelwork, put up the new air port at Croydon for Imperial Airways, Limited, completed last year, and have built aerodromes abroad for the British Government. Some 200 tons of material will be used.

Gasified Pulverised Fuel (G.P.F.), Limited, of Canada House, 4-5, Norfolk Street, Strand, London, W.C.2, announce that they have acquired the goodwill and business of the Holbeck Engineering Company, previously operated by Messrs. Fraser & Chalmers Engineering Works, of Erith. The alliance of the Holbeck systems with the patented G.P.F. pulverised-fuel burners places them in a position to undertake any pulverised-fuel business covering a wide range, both in the boiler field and for the metallurgical industry.

Owing to the increasing business of the asbestos cement units of the Turner & Newall, Limited, group, a new sales company, styled Asbestos Cement Building Products, Limited, has been established to include in its scope the entire sales activities of Turner Brothers Asbestos Company, Limited, at Trafford Park, Manchester, Bell's Poilite and Everite Company, Limited, London, and British Fibrocement Works, Limited, Erith. This new company will have its headquarters at Trafford Park, Manchester, with branch offices in London, Birmingham, Newcastle-upon-Tyne and Glasgow.

Messrs. Ohio Steel Foundry Company, of Lima, Ohio, America, has placed a contract for the erection of a foundry, 100 by 200 ft., at its Springfield works. This is to be equipped with an electric furnace and modern equipment, and will be used exclusively for manufacturing Fahrite heat-resisting alloy castings and for the Company's other alloy products. These alloy castings have been produced for the past seven years in the Company's electric steel foundry at Springfield. With the erection of the new foundry, the manufacture of alloy castings will be segregated in a separate building and under separate supervision.

Contracts Open.

Cairo, October 15.—Two Diesel-engine pumping units, for the Ministry of Public Works. The Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1. (Fee £1 0s. 6d., non-returnable.)

Johannesburg, October 11.—Cast-iron pipes and steel piping, for the Borough of Durban, Borough Water Engineer's Department. The Department of Overseas Trade. (Reference A.X. 8,525-6.)

Rhosneigr.—1,875 yds. of 4-in., 2,000 yds. of 3-in. and 1,083 yds. of 2-in. cast-iron pipes, with fittings, for the Valley Rural District Council. Messrs. H. Adams & Son, 60, Queen Victoria Street, London, E.C.4.

Rhosneigr.—Two sets of treble pumps, oil engines, pressure filters, etc., for the Valley Rural District Council. Messrs. H. Adams & Son, 60, Queen Victoria Street, London, E.C.4.

St. Mellons, September 28.—2,950 lineal yds. of 9-in. dia. and 1,100 yds. of 6-in. dia. cast-iron spigot and socket pipes, for the St. Mellons Rural District Council. Messrs. Thomas & Morgan & Partners, civil engineers, Pontypridd. (Fee £5 5s., returnable.)

Personal.

Mr. R. Young, who has been employed for 25 years at the L.M.S. works at Derby, has been presented with a fumed-oak clock by the workmen in various departments of the works.

Mr. W. A. Forbes, assistant to the president of the United States Steel Corporation, has sailed from America for a two-months' business tour of the various industrial centres of Europe.

Mr. E. J. Fox, managing director of The Stanton Ironworks Company, Limited, has joined the Board of Messrs. Crompton Parkinson, Limited, Electrical Engineers, Bush House, Aldwych, W.C.2.

Mr. T. Danks, formerly works manager at Cleator Moor ironworks, who is now a partner in the Cleator Forge, Limited, has erected a cupola at the forge works for the making of iron. The cupola was put into operation last week.

Mr. R. Scott, formerly sales manager of the Gardner-Denver Company, of Denver, Quincy, Illinois, America, is *en route* to London, where he will act as one of the Company's foreign-branch managers.

Mr. F. Godfrey, of Messrs. R. Taylor & Company, Muirhall Foundry, Larbert, was waited upon by a deputation of the employees on September 17 and presented with a silver tea service on the occasion of his marriage.

Mr. H. J. Barlow, of Messrs. H. J. Barlow & Company, nut and bolt manufacturers, Wednesbury, who is a member of the Wednesbury Town Council, has accepted an invitation to become Mayor of the borough for the coming municipal year.

Mr. Murdoch MacKenzie, of Glasgow, has been re-elected in the second ballot as technical adviser for the Shipwrights' and Ship Constructors' Society. Mr. MacKenzie has held the position since 1918, and was re-elected by the largest vote recorded for any of the positions now being filled.

Mr. W. D. Moore, president of the American Cast Iron Pipe Company, of Birmingham, U.S.A., and an officer of the Sand Spun Patents Corporation, the licensing company for sand-spun centrifugal pipe, is visiting England to negotiate with foundries on licences for the sand-spun process.

Sir Ernest William Moir, Bt., has accepted the invitation of the Council of the Junior Institution of Engineers to become President of the Institution in succession to Lt.-Col. J. T. C. Moore-Brabazon. His induction will take place at a meeting to be held at the Royal Society of Arts, London, on December 13 next, when he will deliver his presidential address.

According to the "Iron Age," Mr. Morten Grindal, who spent about a year in the United States investigating foundry apparatus and machinery, has established his own firm in Sweden as a maker of foundry equipment. He had formerly been engaged in this and allied lines in Norway. His company is the A.-B. Motala Maskiner, Motala, Sweden, and, among other things, has a type of moulding machine by which the sand is packed in the flask by subjecting the mould carrier to a hammering action while the mould is under pressure. He has filed patent applications in the United States.

Wills.

Kinghorn, J. P., iron, steel and ore merchant, of 247, St. Vincent Street, Glasgow	£2,090
Fyfe-Jamieson, J. F., a director of Messrs. W. J. Dixon & Company, iron and steel merchants, Glasgow	£1,308,791
Woodhouse, G. H., managing director of Messrs. Woodhouse & Company, Limited, ironfounders, Hexthorpe Works, Doncaster	£167,438

Obituary.

Mr. T. J. Jennings, a director of the Phœnix Engineering Company, Limited, Chard, Somerset, has died at the age of 64.

Mr. L. Gollance, a partner in the firm of Philipp & Lion, metal, ore and mineral merchants, of Finsbury Square, London, E.C.2, died recently.

The death occurred of Mr. David Dickson, retired ironfounder, at his residence in Falkirk, on September 16. Mr. Dickson was a native of Airdrie, and went to Falkirk 35 years ago. He had been a director of the Forth and Clyde and Sunnyside Iron Company, Limited, Falkirk, since its inception in 1898 as a public company until he retired a few years ago. In local ironfounding circles he was well known and appreciated for his fine business ability. He was 75 years of age and unmarried.

BLACKING,
PLUMBAGO,
CORE GUM,
WHITE DUST,
COAL DUST.

ESTABLISHED 1863.

JAS. DURRANS & SONS, LTD.
PHŒNIX WORKS, PENISTONE, near SHEFFIELD.

Telephone:
21 PENISTONE.
Telegrams:
"DURRANS, PENISTONE."

FOUNDRY EQUIPMENTS

LADLES,
FIRE BRICKS,
STONE FLUX,
CASTING CLEANERS,
PIPE NAILS,
SPRIGS,
WIRE BRUSHES,
BELLOWS,
CUPOLAS,
GANISTER,
LOAM AND SAND MILLS,
STUDS,
CHAPLETS,
BRUSHES,
CORE ROPES,
BUCKETS,
SPADES, Etc.

Write for Illustrated Catalogue on Blacking and Foundry Requisites.

ALLDAYS & ONIONS LTD

For Quality plant at competitive prices, send all your enquiries and orders to Alldays & Onions. Keen and prompt service given.

ROOTS BLOWERS.
CUPOLAS.
CHARGING MACHINES.
LADLES.
FANS for all purposes.
SAND MILLS.
FURNACES.
HAMMERS, steam and pneumatic.

GREAT WESTERN WORKS, BIRMINGHAM, and 9, VICTORIA STREET, LONDON, S.W.1.

THE WELSH NAVIGATION STEAM COAL CO., LTD.,
PROPRIETORS AND SHIPPERS OF
WELSH NAVIGATION
SPECIAL FOUNDRY COKE
as used in many of the principal Foundries in this Country and abroad.
Sulphur Content ... ·50% or under. Ash ... ... 6% or under.
Please address enquiries to:
THOMAS & DAVEY, LTD., Cambrian Buildings, Cardiff.
(Sole Sales Agents.)
Midland Agency:
W. C. M. JAMES, Exchange Buildings, Birmingham.

Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—One of the most encouraging signs of the moment in connection with the Cleveland iron market is that, for the first time since the spring, it is now possible to place orders for ordinary foundry iron with some degree of certainty of delivery within a reasonable period. For some time past market operations have been hampered by this obstacle, with the result that substantial orders were recently diverted to Midland furnaces, while makers have been equally embarrassed by a glut of business which could not be executed within a reasonable period. Arrears of delivery have now, however, been largely overtaken, and, as it is believed that heavy industrial needs have yet to be covered, a period of increased activity is looked for in the near future. Already a number of orders have been placed to the end of the year, and some contracts fixed extend into the first quarter of 1930. Meanwhile, makers' minimum prices remain:—No. 1 Cleveland foundry iron, 75s.; No. 3 G.M.B., 72s. 6d.; No. 4 foundry, 71s. 6d.; No. 4 forge, 71s. per ton.

Conditions in the North-East Coast market for hematite must be regarded as unsatisfactory from the makers' point of view, production costs still exceeding a profit basis, while any attempt to impose higher prices appears to kill buyers' interest at once, and, supplies being ample, there is keen competition for orders. Prices, however, are this week 6d. higher at 76s. 6d. for mixed numbers and 77s. for No. 1 quality. On the North-West Coast, Bessemer mixed numbers rule firm at 75s. per ton at works.

LANCASHIRE.—Business in local markets for foundry pig has now settled down for the usual autumn buying, the leading furnace interests reporting a steady flow of orders for forward delivery. Prices remain firm as previously quoted, with No. 3 Staffordshire at 75s. 6d., No. 3 Derbyshire at 74s. 6d. and Scottish brands at 92s. 6d. to 93s. 6d., all delivered local stations.

THE MIDLANDS.—Conditions at this week's Birmingham market for foundry pig developed a fairly active demand on consumers' account, with a further expansion of buying for autumn requirements. There was, however, no variation in prices current, which remain nominally as follow:—No. 3 Northants, 72s. 6d.; No. 3 Derbyshire, 76s.; No. 3 Staffordshire, 77s., with Scotch No. 3 from 94s. upwards, all per ton delivered local stations.

SCOTLAND.—No improvement can be reported in the condition of the Scotch pig-iron market. Business in foundry iron is quiet, and the demand very spasmodic. The price of 76s. for No. 3 foundry, f.o.t. furnaces, is unchanged, though the makers would like to obtain a better figure, as costs continue to move against them. They recognise, however, that to advance the price is not going to help business, and they are reluctant, therefore, to take any action in this direction.

Finished Iron.

The only bright feature in the iron market is the continued expansion of the demand for Staffordshire marked bars. The works engaged on this class of material continue to be very well occupied, and adhere to the figure of £12 at works. The price of crown bars continues to vary to a considerable degree. Orders of any note are entirely absent, and there is much competition for what business there is emanating from consumers and warehouses in the district. A good crown iron of Staffordshire make would cost £10 to £10 5s., and crown iron from other districts may be obtained at £9 15s. Lancashire bar-iron makers report business this week to have been on a very moderate scale, although they are able to maintain prices. Crown bars are on offer at £10 15s. per ton, and seconds at £9 15s.

Steel.

Markets for steel, both finished and semi-products, have been rather irregular of late, substantial inquiries for Continental material having been circulated, and orders totalling a considerable tonnage placed at the low prices recently ruling. The demand for British material has been affected to some extent by these transactions, but the home manufacturers report that they are still securing a fair amount of business. The demand for finished steel continues irregular, and, while some export buying is reported, there has been no general revival in that department. In the home trade the general demand seems to be slowly expanding. The tinplate market remains steady, with current quotations ruling from 18s. 6d. to 18s. 9d. basis for coke quality, net cash, f.o.b. Wales.

Scrap.

Some slight improvement in the demand for foundry scrap material may be noted in individual cases, but generally business continues quiet, with prices mostly unchanged. On Tees-side, heavy cast-iron prices keep remarkably steady, small parcels of ordinary quality still realising 67s. per ton and good machinery quality in handy sizes 68s. 6d. per ton. In the Midlands cast-iron scrap is firm, 70s being offered for machinery quality in cupola sizes, 65s. for heavy scrap and 60s. for light cast-iron scrap. In Scotland dealings in the cast-iron scrap market show little change, particularly in requirements for foundries, and machinery quality is rather quiet at 70s., with ordinary cast-iron scrap at 65s. Old cast-iron railway chairs are at 67s. 6d. to 68s. 6d., light cast-iron scrap 60s. to 62s. 6d., and for fire-bars around 58s. 6d. is quoted, all per ton delivered f.o.t. consumers' works.

Metals.

Copper.—The crisis in the financial world during the current week has naturally had a reactionary effect upon markets for base metals, although, so far, without serious disturbance of the generally steady tendency of business. Consumptive demand for copper continues fairly strong at home and abroad, while the statistical position remains satisfactory, and, notwithstanding a slight weakening of values at last week's closing market, the outlook is not regarded as justifying pessimism.

Closing quotations are:—

Cash.—Thursday, £74 11s. 3d. to £74 12s. 6d.; Friday, £74 10s. to £74 12s. 6d.; Monday, £74 to £74 2s. 6d.; Tuesday, £74 6s. 3d. to £74 7s. 6d.; Wednesday, £74 to £74 1s. 3d.

Three Months. — Thursday, £75 2s. 6d. to £75 3s. 9d.; Friday, £75 to £75 2s. 6d.; Monday, £74 11s. 3d. to £74 12s. 6d.; Tuesday, £74 15s. to £74 17s. 6d.; Wednesday, £74 10s. to £74 12s. 6d.

Tin.—Markets for standard tin continue dull and uneventful, although with little change in actual quotations. The issue of the August tin statistics discloses few features out of the ordinary, as may be realised from the details, as follow:—

Total Visible Supply.—Month's shipments, 10,436 tons; other afloat, 3,373 tons; total afloat, 13,809 tons; landing, 2,455 tons; in warehouse, 10,136 tons; total stocks, 12,591 tons. Total visible supply, 26,460 tons.

Official closing prices:—

Cash.—Thursday, £204 7s. 6d. to £204 10s.; Friday, £205 2s. 6d. to £205 5s.; Monday, £205 12s. 6d. to £205 17s. 6d.; Tuesday, £205 7s. 6d. to £205 10s.; Wednesday, £204 12s. 6d. to £204 17s. 6d.

Three Months. — Thursday, £208 2s. 6d. to £208 5s.; Friday, £209 2s. 6d. to £209 5s.; Monday, £209 10s. to £209 12s. 6d.; Tuesday, £209 5s. to £209 7s. 6d.; Wednesday, £208 10s. to £208 12s. 6d.

Spelter.—The outlook for this metal shows little change, and interest at the moment is centred on whether the Cartel will decide to make a further restriction in output at its forthcoming meeting.

Daily quotations are:—

Ordinary.—Thursday, £24 7s. 6d.; Friday, £24 7s. 6d.; Monday, £24 1s. 3d.; Tuesday, £24; Wednesday, £23 17s. 6d.

Lead.—The demand for lead still continues on quiet lines, and supplies are sufficient to meet all requirements. Fluctuations in values have been confined within very narrow limits, quotations remaining practically at a stationary level.

Prices have been:—

Soft Foreign (Prompt).—Thursday, £23 12s. 6d.; Friday, £23 12s. 6d.; Monday, £24 1s. 3d.; Tuesday, £23 13s. 9d.; Wednesday, £23 12s. 6d.

Book Review.

The Manufacture of Chilled Iron Rolls, by Archibald Allison. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 8s. 6d. net.

Pitmans' have added to their list of technical publications a book which will arouse great interest not only on account of the straightforward record which it gives of the author's experiences and experiments, but also because this is the first time that an English roll-foundry metallurgist has had the vision and the ability (perhaps one should also add "the opportunity") to put forward a published volume on this important craft.

Within the scope of 12 chapters—illustrated by 33 very clear photographs, prints and diagrams—the author briefly outlines the metallurgical considerations affecting chilled roll practice, explains in more detail his own developments, and summarises the results obtained.

Chapter I is introductory, Chapter II contains some rather unnecessary notes on cupola practice, but Chapters III and IV give a very interesting account of cupola-made rolls, and though the author falls back upon the time-honoured conclusion that the cupola alone is not a suitable instrument for most roll production, he did not take this fact for granted, and having tried the matter out for himself knows exactly how and why the cupola falls short, so was able, as explained in Chapter V, to develop its use in conjunction with an oil-fired hearth furnace. If this book can induce a general study of the possibilities of shaft-melting plus hearth-refining for high-grade cast iron, he will have deserved well of the roll trade.

"Materials" and "The Chill Test" are lucidly dealt with, though the rather surprising statement is made (on page 48) that nickel was found to sharpen the boundary line between chill and grain back.

The chapters on "Casting," "Microscopy and Mechanical Tests" and "Consideration of Results" are soundly orthodox in the main, though exception may be taken to the generalisation at the head of Chapter X that microscopic examination does not afford information commensurate with the labour involved, as does steel. There are some chilled-roll problems which only the microscope can probe.

An Appendix deals with analytical and micrographic matters which might well have been left to other publications.

In conclusion, it may be said that the author deals only with small rolls and a small melting plant, but is in the fortunate position of being able to study in service the rolls which he has made, and while he makes no claim that his book is an exhaustive treatise on its subject, unquestionably offers a most valuable technical contribution to an industry which has hitherto almost completely lacked such contributions.

In its modest way "The Manufacture of Chilled Iron Rolls" is a metallurgical landmark.

Publication Received.

"The Welder." Messrs. Alloy Welding Processes, Limited, of Ferry Lane Works, Forest Road, Walthamstow, London, E.17, have taken a decision to publish bi-monthly a house organ carrying the above title. It is being carried out on different lines from most, as it does not pretend to serve the interests of the staff but rather of the sales department. We think that such publications should carry a title like the "Edgar Allen News," as the present caption leads one to think that it is devoted to the general interests of the industry rather than those of the issuing company.

"SERVICE BCM/GX FIRST."

Telephones:
SHEFFIELD
22311 (3 lines)
LONDON
1483 Central
GLASGOW
South 1580
WORKSOP 205
AMBERGATE 7
STOCKSBRIDGE 27
GALSTON 49

MANUFACTURERS & PRODUCERS OF REFRACTORY MATERIALS OF EVERY DESCRIPTION,
BRICKMAKERS · QUARRY AND MINEOWNERS CONTRACTORS & EXPORTERS.

GENERAL REFRACTORIES
LIMITED
Incorporating
THE GENERAL REFRACTORIES CO., LTD. THE MIDLAND REFRACTORIES CO., LTD.
THOMAS BROOKE & SONS LTD. WORKSOP BRICK CO., LTD. GUISELEY SILICA CO. LTD.

Telegrams
"GENEFRAX"
Sheffield
London
Glasgow
Worksop
Monomarks
BCM/GX
BCM/ Magnesia
BCM/ Coroma
BCM/ Pyrolyte
BCM/ Insulite

KELHAM ISLAND MILLS SHEFFIELD · LONGROUNDS BRICKWORKS WORKSOP · Notts. · BULLBRIDGE BRICKWORKS AMBERGATE · Derbys · GAYTON ROAD MILLS KINGS LYNN · THE BATTS MILLS WOLSINGHAM · Dur. · BRACKENHOOR FIRECLAY WORKS · STOCKSBRIDGE · LOUDOUN MILLS GALSTON · Ayrshire
AND AT MANSFIELD, WARSOP, EBBERSTON, CORBRIDGE, BRAMCOTE, LUFFENHAM, TOW LAW, MONTGREENAN &c.&c.

LONDON OFFICE
20 Budge Row E.C.4. (M° A.C. Turner)

Head Office
Wicker Arches, SHEFFIELD

GLASGOW OFFICE
82 Dale St. C.5. (M° A.W. Montgomery)

"YORKSHIRE SAND"

FOR

STEEL FOUNDERS

IS THE ONE AND ONLY REGULAR,
RELIABLE, ECONOMICAL, EFFICIENT

BRITISH ALTERNATIVE

TO

INFERIOR FOREIGN SANDS

WHOSE USE WEAKENS THE NATIONAL RESOURCES
AND HELPS TO SWELL UNEMPLOYMENT RETURNS

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	74	0	0
Three months	74	10	0
Electrolytic	84	5	0
Tough	78	10	0
Best selected	79	0	0
Sheets	110	0	0
India	96	10	0
Wire bars	84	12	6
Do. Oct.	84	12	6
Do. Nov.	84	12	6
Ingot bars	—		
H.C. wire rods	86	15	0
Off. av. cash, August	73	16	8⅞
Do. 3 mths., August	74	12	2⅞
Do., Sttlmnt., August	73	16	3⅞
Do., Electro, August	84	10	0
Do., B.S., August	78	5	10
Aver. spot price, copper, Aug.	73	16	8⅞
Do. wire bars, August	84	15	0

Solid drawn tubes .. 15d.
Brazed tubes .. 15d.
Wire .. 11½d.

BRASS.

Solid drawn tubes .. 12½d.
Brazed tubes .. 14½d.
Rods, drawn .. 12½d.
Rods, extd. or rlld. 8d.
Sheets to 10 w.g. .. 11½d.
Wire .. 11½d.
Rolled metal .. 10½d.
Yellow metal rods .. 8d.
Do. 4 × 4 Squares .. 8½d.
Do. 4 × 3 Sheets .. 9d.

TIN.

	£	s.	d.
Standard cash	204	12	6
Three months	208	10	0
English	204	0	0
Bars	206	15	0
Straits	209	12	6
Australian	207	17	6
Eastern	213	5	0
Banca	217	7	6
Off. av. cash, August	209	17	11⅞
Do., 3 mths., August	213	17	6
Do., Sttlmt., August	209	17	7⅞
Aver. spot, August	209	17	11⅞

SPELTER.

	£	s.	d.
Ordinary	23	17	6
Remelted	22	10	0
Hard	20	5	0
Electro 99.9	26	0	0
English	24	7	6
India	21	10	0
Zinc dust (Nom.)	34	10	0
Zinc ashes	8	10	0
Off. aver., August	25	0	7½
Aver., spot, August	24	17	11

LEAD.

	£	s.	d.
Soft foreign ppt.	23	12	6
English	25	0	0
Off. average, August	23	4	5 3/4
Average spot, August	23	3	8⅞

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	33	5	0
Do. V.M. ex-whf.	32	2	6
Rods	40	0	0
Boiler plates	30	0	0
Battery plates	30	10	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	50	5	0
Chinese	31	0	0
Crude	Nominal		

QUICKSILVER.

	£	s.	d.
Quicksilver	22	7	6

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—
25% .. 7 15 0
45/50% .. 12 0 0
75% .. 19 10 0
Ferro-vanadium—
35/50% .. 12/10 lb. Va.
Ferro-molybdenum—
70/75% c. free .. 4/- lb. Mo.
Ferro-titanium—
23/25% carbonless .. 11d. lb.
Ferro-phosphorus, 20/25% .. £16 0 0
Ferro-tungsten—
80/85%, c. fr. .. 3/3½ lb.
Tungsten metal powder—
98/99% .. 3/6½ lb.
Ferro-chrome—
2/4% car. .. £32 10 0
4/6% car. .. £23 7 6
6/8% car. .. £22 12 6
8/10% car. .. £22 2 6
Ferro-chrome—
Max. 2% car. £33 0 0 to 34 0 0
Max. 1% car. .. £37 10 0
Max. 0.70% car. .. £41 0 0
70% carbonless .. 1/- lb.
Nickel—99% cubes, or pellets £175 0 0
Ferro-cobalt .. 9/4 lb.
Aluminium 98/99% .. £95 0 0
Metallic chromium—
96/98% .. 2/6 lb.
Ferro-manganese (net)—
76/80% loose .. £13 10 0
76/80% packed .. £14 10 0
76/80% export .. £14 0 0
Metallic manganese—
94/96%, carbonless .. 1/6 lb.
Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten £0 2 0
Finished bars, 18% tungsten £0 2 9
Per lb. net, d/d buyers' works.
Extras—
Rounds and squares, 3 in. and over .. 4d. lb.
Rounds and squares, under ½ in. to ¼ in. .. 3d. lb.
Do., under ¼ in. to 1/16 in. .. 1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ¾ in. .. 3d. lb.
Do., under ½ in. × ¼ in. .. 1/- lb.
Bevels of approved sizes and sections .. 6d. lb.
Bars cut to length, 10% extra

SCRAP.

South Wales—	£	s.	d.		£	s.	d.
Heavy steel	3	15	0	to	3	16	0
Bundled steel and shrngs.	3	10	0	to	3	14	0
Mixed iron and steel	3	9	0	to	3	11	0
Heavy cast iron					2	17	6
Good machinery for foundries					3	0	0

Cleveland—							
Heavy steel					3	6	6
Steel turnings					2	16	6
Cast iron borings					2	15	0
Heavy forge					3	17	6
W.I. piling scrap					3	10	0
Cast-iron scrap	3	6	6	to	3	8	6

Lancashire—							
Cast-iron scrap	3	2	6	to	3	10	0
Hvy. wrought					4	0	0
Steel turnings					2	17	6

Scotland—							
Heavy steel					3	15	0
Cast-iron borings					2	15	0
Wrought-iron piling					3	19	6
Heavy machinery					3	10	0

London—Merchants' buying prices delivered yard.

Copper (clean)					68	0	0
Brass					43	0	0
Lead (less usual draft)					21	5	0
Tea lead					17	0	0
Zinc					16	10	0
New aluminium cuttings					68	0	0
Braziery copper					58	0	0
Gunmetal					59	0	0
Hollow pewter					150	0	0
Shaped black pewter					106	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—
Foundry No. 1 .. 75/-
Foundry No. 3 .. 72/6
Foundry No. 4 .. 71/6
Forge No. 4 .. 71/-
Hematite No. 1 .. 77/-
Hematite M/Nos. .. 76/6

N.W. Coast—
Hem. M/Nos. d/d Glas. .. 86/-
„ d/d Birm. .. 92/6

Midlands—
Staffs. common* .. —
„ No. 4 forge* .. 73/-
„ No. 3 fdry* .. 77/-
Shrops. basic .. —
„ Cold blast, ord. .. —
„ „ roll iron .. —
Northants forge* .. 68/6
„ fdry. No. 3* .. 72/6
Derbyshire forge* .. 72/-
„ fdry. No. 3* .. 76/-
„ basic* .. —
* d/d Black Country dist.

Scotland—
Foundry No. 1 .. 78/6
„ No. 3 .. 76/-
Hem. M/Nos. .. 80/-

Sheffield (d/d district)—
Derby forge .. 67/-
„ fdry. No. 3 .. 71/-
Lincs. forge .. 70/6
„ fdry. No. 3 .. 74/6
E.C. hematite .. 88/-
W.C. hematite .. 87/6

Lincs. (at furnaces)—
Forge No. 4 .. —
Foundry No. 3 .. —
Basic .. —

Lancashire (d/d eq. Man.)—
Derby forge .. —
„ fdry. No. 3 .. 74/6
Northants foundry No. 3 .. —
Dalzell, No 3 (special) 102/6 to 105/-
Summerlee, No. 3 .. 93/-
Glengarnock, No. 3 .. —
Gartsherrie, No. 3 .. 93/-
Monkland, No. 3 .. 93/-
Shotts, No. 3 .. 93/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.		£	s.	d.
Bars (cr.) nom.					10	15	0
Nut and bolt iron	9	0	0	to	9	5	0
Hoops	11	0	0	to	11	10	0
Marked bars (Staffs) f.o.t.					12	0	0
Gas strip	11	0	0	to	11	10	0
Bolts and nuts, ¾ in. × 4 in.					15	5	0

Steel—							
Ship plates	8	12	6	to	8	17	6
Boiler plts.	9	12	6	to	10	10	0
Chequer plts.					10	12	6
Angles					8	2	6
Tees					9	2	6
Joists					8	2	6
Rounds and squares, 3 in. to 5½ in.					9	2	6
Rounds under 3 in. to ⅜ in. (Untested)					8	0	0
					and upwards		
Flats, over 5 in. wide and up					8	7	6
Flats, 5 in. to 1½ in.					7	17	6
Rails, heavy					8	10	0
Fishplates					12	10	0
Hoops (Staffs)					10	0	0
Black sheets, 24g.	10	5	0	to	10	10	0
Galv.cor.shts., 24g.	13	5	0	to	13	10	0
Galv. fencing wire 8g. plain					12	0	0
Billets, soft	6	5	0	to	6	15	0
Billets, hard	7	10	0	to	8	0	0
Sheet bars					6	5	0
Tin bars					6	5	0

PHOSPHOR BRONZE.

Per lb. basis.

Strip	1/4
Sheet to 10 w.g.	1/5
Wire	1/6½
Rods	1/5
Tubes	1/9½
Castings	1/4

Delivery 3 cwt. free.
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

per lb.

Ingots for raising	10d. to 1/4
Rolled—	
To 9 in. wide	1/4 to 1/10
To 12 in. wide	1/4½ to 1/10½
To 15 in. wide	1/4½ to 1/10½
To 18 in. wide	1/5 to 1/11
To 21 in. wide	1/5½ to 1/11½
To 25 in. wide	1/6 to 2/-
Ingots for spoons and forks	10d. to 1/6½
Ingots rolled to spoon size	1/1 to 1/9½
Wire round—	
3/0 to 10 G.	1/7½ to 2/2½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2X foundry, Phila.	21.26
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic	20.26
Bessemer	20.76
Malleable	20.76
Grey forge	19.76
Ferro-mang. 80% d/d	105.00
O.-h. rails, h'y at mill	43.00
Bessemer billets	35.00
O.-h. billets	35.00
O.-h. sheet bars	35.00
Wire rods	42.00
	Cents.
Iron bars, Phila.	2.12
Steel bars	1.95
Tank plates	1.95
Beams, etc.	1.90
Skelp, grooved steel	1.90
Skelp, sheared steel	1.90
Steel hoops	2.20
Sheets, black, No. 24	2.85
Sheets, galv., No. 24	3.50
Sheets, blue an'l'd, No. 13	2.35
Wire nails	2.55
Plain wire	2.40
Barbed wire, galv.	3.20
Tinplates, 100 lb. box	$5.35

COKE (at ovens).

Welsh foundry .. 25/- to 32/-
„ furnace .. 21/- to 22/-
Durham and North.
„ foundry .. 22/6
„ furnace .. 20/6
Midlands, foundry .. —
„ furnace .. 21/6 and up

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes	20×14 box	..	18/9
„	28×20 „	..	37/6
„	20×10 „	..	27/6
„	18¾×14 „	..	19/6
C.W.	20×14 „	..	15/6
„	28×20 „	..	34/-
„	20×10 „	..	22/7½
„	18¾×14 „	..	16/-
Terneplates	28×20	..	33/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7	10	0
Bars, hammered, basis	£17	10	0	to	£18	10	0
Bars and nail-rods, rolled, basis	£15	15	0	to	£16	15	0
Blooms	£10	0	0	to	£12	0	0
Keg steel	£32	0	0	to	£33	0	0
Faggot steel	£20	0	0	to	£24	0	0
Bars and rods, dead soft, steel	£10	0	0	to	£14	0	0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Over ⅛ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	65% ..	.. 47½%
Water ..	.. 61½% ..	.. 42½%
Steam ..	.. 57½% ..	.. 37½%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

	£	s.	d.		
Sept. 19 ..	74	11	3	dec.	1/3
„ 20 ..	74	10	0	„	1/3
„ 23 ..	74	0	0	„	10/–
„ 24 ..	74	6	3	inc.	6/3
„ 25 ..	74	0	0	dec.	6/3

Electrolytic Copper.

	£	s.	d.			
Sept. 19 ..	84	5	0	No	change	
„ 20 ..	84	5	0	„	„	
„ 23 ..	84	5	0	„	„	
„ 24 ..	84	5	0	„	„	
„ 25 ..	84	5	0	„	„	

Standard Tin (cash).

	£	s.	d.			
Sept. 19 ..	204	7	6	No	change	
„ 20 ..	205	2	6	inc.	15/–	
„ 23 ..	205	12	6	„	10/–	
„ 24 ..	205	7	6	dec.	5/–	
„ 25 ..	204	12	6	„	15/–	

Tin (English ingots).

	£	s.	d.			
Sept. 19 ..	204	10	0	No	change	
„ 20 ..	205	5	0	inc.	15/–	
„ 23 ..	205	0	0	dec.	5/–	
„ 24 ..	204	15	0	„	5/–	
„ 25 ..	204	0	0	„	15/–	

Zinc Sheets (English).

	£	s.	d.			
Sept. 19 ..	33	5	0	No	change	
„ 20 ..	33	5	0	„	„	
„ 23 ..	33	5	0	„	„	
„ 24 ..	33	5	0	„	„	
„ 25 ..	33	5	0	„	„	

Spelter (ordinary).

	£	s.	d.		
Sept. 19 ..	24	7	6	dec.	1/3
„ 20 ..	24	7	6	No	change
„ 23 ..	24	1	3	dec.	6/3
„ 24 ..	24	0	0	„	1/3
„ 25 ..	23	17	6	„	2/6

Lead (English).

	£	s.	d.		
Sept. 19 ..	25	0	0	No	change
„ 20 ..	25	0	0	„	„
„ 23 ..	25	0	0	„	„
„ 24 ..	25	0	0	„	„
„ 25 ..	25	0	0	„	„

AVERAGE PRICES OF STEEL RAILS.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1908	6 2 6	6 0 0	6 0 0	5 15 6	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 10 0	5 16 3
1909	5 5 0	5 5 0	5 5 0	5 0 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0
1910	5 5 0	5 7 6	5 7 6	5 7 6	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 8 11½
1911	5 15 0	5 15 0	5 15 0	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 13 1½
1912	5 13 1	5 15 0	5 15 0	5 15 7	6 1 6	6 6 3	6 7 6	6 8 0	6 11 3	6 12 6	6 12 6	6 13 9	6 4 4
1913	6 15 0	6 14 4½	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 10 0	6 10 0	6 10 0	6 10 0	6 12 0
1914	6 10 0	6 10 0	6 6 3	6 0 0	6 0 0	6 0 0	5 14 0	6 2 6	6 13 9	6 12 0	6 7 6	6 7 6	6 5 3½
1915	6 10 6	6 17 6	7 5 0	7 12 6	7 12 6	7 17 6	8 17 6	9 2 6	9 2 6	9 2 6	9 7 6	10 10 6	8 6 6½
1916	10 19 4	11 0 0	11 0 0	10 18 9	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 9 10
1917	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6
1918	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6
1919	10 17 6	13 7 6	13 7 6	13 7 6	15 0 0	15 10 0	16 0 0	16 10 0	16 10 0	16 10 0	16 10 0	17 5 0	14 12 11
1920	18 15 0	19 5 0	20 7 6	22 0 0	24 0 0	23 0 0	24 0 0	25 0 0	25 0 0	25 0 0	25 0 0	25 0 0	22 18 11½
1921	23 5 0	20 4 0	18 0 0	17 0 0	15 0 0	15 0 0	14 0 0	14 0 0	14 0 0	11 12 6	10 10 0	10 0 0	15 4 3
1922	9 10 0	9 10 0	9 10 0	9 10 0	9 10 0	9 10 0	9 10 0	9 0 0	8 15 0	8 15 0	8 15 0	8 15 0	9 4 2
1923	8 17 6	9 2 0	10 5 0	10 10 0	10 10 0	10 10 0	9 15 0	9 0 0	8 15 0	8 15 0	8 19 0	9 5 0	9 9 10
1924	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	9 2 6	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 2 3½
1925	9 0 0	9 0 0	9 0 0	9 0 0	8 15 0	8 10 7½	8 10 0	8 10 0	8 10 0	8 4 0	8 0 0	8 0 0	8 11 7½
1926	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 7 6	8 10 0	8 10 0	8 10 0	8 10 0	8 3 11½
1927	8 10 0	8 10 0	8 10 0	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 3 0	8 5 0	8 5 0	8 4 10
1928	8 5 0	8 5 0	8 5 0	8 5 9	8 6 3	8 6 3	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 7 9½
1929	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	—	—	—	—	—

AVERAGE MONTHLY PRICES OF EAST COAST HEMATITE AT MIDDLESBROUGH.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1915	83 11	88 6	94 8	107 0	102 6	101 3	98 9	98 7½	96 6	104 0	124 1	130 0	106 11½
1916	133 9	140 0	136 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	128 1½
1917	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6
1918	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6
1919	122 6	122 6	122 6	122 6	179 2	190 0	197 6	200 0	200 0	200 0	200 0	200 0	171 4
1920	220 0	220 0	240 0	260 0	260 0	260 0	260 0	260 0	260 0	260 0	260 0	260 0	251 8
1921	240 0	220 0	180 0	180 0	180 0	160 0	160 0	160 0	137 0	127 6	117 6	104 6	162 2
1922	97 6	91 7½	100 0	98 6	97 1½	94 7	93 6	90 9	89 7	91 10½	93 0	93 2	94 5½
1923	94 6	104 9	122 0	126 10½	122 0	115 3	107 0	98 8½	98 10½	99 1½	100 6½	102 3	107 10½
1924	102 4½	101 3	99 7½	99 0	98 9½	97 4½	95 3½	93 1½	90 7½	88 0	88 4½	88 5	95 2½
1925	87 5	85 9	84 7½	82 6	80 10½	79 3	77 1	75 7½	75 0	74 3½	74 9	76 0	79 5½
1926	77 3	77 9	77 3½	76 3	77 4½	78 0	79 8½	81 9	83 4½	87 7½	92 6	90 5½	81 7½
1927	90 0	90 0	86 3½	83 1½	80 6	78 0	76 6	75 4½	75 0	72 9	71 9	71 1½	79 2½
1928	69 7½	69 7½	69 9	70 0	70 0	69 3	68 7½	69 2	70 0	70 0	70 3	71 0	69 9½
1929	71 6	72 0	73 6	74 0	74 0	74 1½	74 9	75 6	—	—	—	—	—

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

PIG IRON

SCOTCH, MIDDLESBRO', HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,

19, ST. VINCENT PLACE, GLASGOW.

ZETLAND ROAD, MIDDLESBROUGH.

SMALL ADVERTISEMENTS.

Notice.

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 6 words per line. Minimum charge for one insertion 3/-.

(A remittance should accompany instructions.)

SITUATIONS VACANT AND WANTED.

FOUNDRY FOREMAN in Midlands seeks position, 18 years' experience, with full control in general engineering and jobbing shop; good references; replies confidential.—Box 330, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY MANAGER seeks position; thoroughly practical in all branches; good references; replies confidential.—Box 312, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

JOBBING MOULDER, LOAM OR DRY SAND, age 30, first-class workman, A.M.I.B.F., at present employed in Scotland, desires change, London district preferred; highest references.—Box 320, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

EXPERIENCED CLERK (man) wanted (Midlands); Book-keeping, Shorthand, Typewriting, Invoicing; knowledge of light castings preferred; state married or single, age, salary, references.—Box 332, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WANTED, Works Manager for Motor Cylinder Foundry in Midlands.—Apply, stating age, full details of experience and capabilities, and salary required, to Box 328, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PROPERTY.

11 ACRES WORKS SITE.
SHEFFIELD.
145,000 Sq. Ft. of SHOPPING,
Compact and Convenient.
SIDING CONNECTIONS
with L.M. & S. and L. & N.E. Rlys.
WELL-BUILT & COMMODIOUS OFFICES
Will Sell whole or in lots to suit customers or Let on favourable terms. Unique opportunity for Manufacturers.

Apply—
THOS. W. WARD, LTD.,
ALBION WORKS, SHEFFIELD.

MACHINERY.

SAND MIXERS.—New and Secondhand. Ask us to quote.—W. BREALEY & COMPANY, LIMITED, Prospect Works, Hawksley Avenue, Sheffield.

FOR SALE—One No. 6 "Ajax" Jarring Turnover Machine, nearly new. All moving parts in perfect running condition. A bargain.—Box 326, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

MACHINERY—*Continued.*

B.S.A. Centreless Grinding Machine, for work about 1¼ in. dia. x 6 in. long.
BLANCHARD Type Vertical Surface Grinder, magnetic chuck 19½ in. dia.
No. 7A SUNDERLAND Gear Generating Machine, capacity 18 in. dia. x 9 in. wide.
LANDIS 12 in. x 42 in. Plain Grinding Machine.
30 in. x 18 in. "MARSDEN" "X" TYPE STONE-BREAKER, having two flywheels and driving pulley.
24 in. x 15 in. "GOODWIN BARSBY" STONE-BREAKER, having two flywheels and driving pulley.
COCHRAN VERTICAL BOILER, 15 ft. 0 in. x 6 ft. 10 in., re-insure for 70 lbs. pressure.
SEVERAL DISH-ENDED CYLINDERS, each 6 ft. x 2 ft., tested hydraulically to 80 lbs. pressure.
New PRESSED STEEL SECTIONAL TANKS, plates 4 ft. 0 in. or 1 metre square. All capacities. Easy to erect.

(ASK FOR "ALBION" MACHINERY CATALOGUE.)

THOS. W. WARD, LTD.,
ALBION WORKS, SHEFFIELD.

5-TON GEARED FOUNDRY LADLE, by Thwaites; in excellent condition; price £30, f.o.r.—For further particulars, photograph, etc., write Box 322, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PATENTS AND TRADE MARKS.

PROTECT YOUR IDEAS.—Free, Advice and Handbook on patenting inventions and registering trade marks by Registered Agent with 43 years' experience.—KING'S PATENT AGENCY, LIMITED, 146A, Queen Victoria Street, E.C.4.

MISCELLANEOUS.

RAMMING GANISTER.—Lowest prices from E. STAFFORD, Lowick, Kettering.

PATTERNS OF ALL DESCRIPTIONS. LARGEST WORKS IN THE MIDLANDS. QUOTATIONS BY RETURN.
G. PERRY & SONS,
HIGHCROSS STREET, LEICESTER.

BRASSFOUNDRY RESIDUES. — Ashes, Skimmings, Grindings, Dust, bought for best prices; collected by lorry radius 30 miles London, or ex rail beyond.—Communications, KINRIX, 199-201, Warwick Road, London, W.14. 'Phone: Western 0273.

FLUORSPAR. — The Ideal Flux for all Foundry and Furnace work; supplied in crude lump, washed gravel or finely ground. Samples and prices from
A. BECK,
MINEOWNER, MATLOCK.

GANISTER, best quality, for cupolas, also for Steel Works.—ASTBURY SILICA COMPANY, "The Brooms," Park Lane, Congleton.

BLASTMETER. — CAMPIONS IMPROVED TYPE, No. 152, for 12½ in. dia. main; for sale, cheap.—Write Box 324, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY REQUISITES

Try our REFRACTORIES.

Ganister or Silica Bricks and Blocks (any shape or size)
Sands, Cements, Ganister.—*Let us have your enquiries*

THE
CLEVELAND MAGNESITE & REFRACTORY CO., LTD.
Normanby Brickworks, Normanby, Eston, Yorks

ERITH LOAM
J. PARISH & CO.,
ERITH.

RYLAND'S DIRECTORY
[2,200 pages 8½" × 5½"].

The standard work of reference covering the Coal, Iron, Steel, Tinplate, Metal, Engineering, Hardware and Allied Trades.

A NEW EDITION IS NOW BEING PREPARED FOR PRESS.

ADVERTISEMENT RATES SENT ON REQUEST.

INDUSTRIAL NEWSPAPERS, Ltd.
49, Wellington St., Strand, London, W.C.2.

'Phone: 287 SLOUGH

SANDBLAST PLANTS

12′ × 9′ Room Plant, complete with compressor and all equipment **£340**

Large Barrel Plant, suitable for castings up to 20 lb. weight, complete with compressor and all equipment **£180**

Cabinet Plant, complete with vertical compressor and all equipment **£60**

ABOVE ARE IN STOCK, ready for use.

LARGEST STOCK OF FOUNDRY PLANT IN ENGLAND. PLEASE SEND FOR LISTS.

BUY FROM ME AND SAVE MONEY

ALEX. HAMMOND, *Foundry Machinery Merchant,*
14, AUSTRALIA ROAD, SLOUGH

Telegrams: "Swann, Brassington."
Telephone: Wirksworth 30.

Registered Office:
BRASSINGTON,
near Wirksworth, Derbyshire.

SWANN RATCLIFFE & CO.
Manufacturers of High Temperature Refractory Materials.
SPECIALITIES: Siliceous Fire Bricks and Aluminous Bricks for the Stoker Arches of Babcock & Wilcox and Stirling Boilers, Siemens Furnace Chamber Walls, and Chamber Arches, etc., also specially suitable for the Crowns and Arches of Soaking, Puddling, Re-heating Furnaces, and Gas Works. Especially suitable for Cupola Lining. Raw White Derbyshire and Ground Ganisters—Siliceous Firecla ys, etc.
PLUTO FIRE CEMENT.
FURNACE CONSTRUCTIONAL ENGINEERS.

Contractors to Admiralty. On War Office List.

Works:
BRASSINGTON,
near Wirksworth, Derbyshire.